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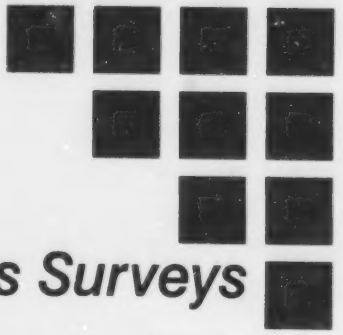


The National Graduates Surveys

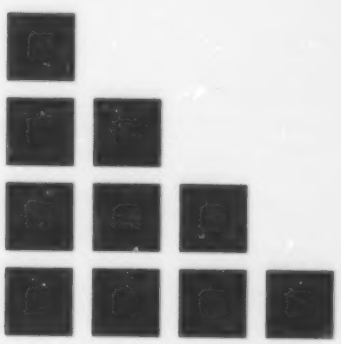
Employment-Equity Groups Among Post-Secondary Graduates

R-00-1-3E

by
Laval Lavallée, Bert Pereboom, Irving Silver and Ted Wannell

December 1999

Research Paper



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▬

This report is part of a set of research studies on the National Graduates Surveys. /
Le présent rapport fait partie d'un ensemble d'études sur les Enquêtes nationales auprès de diplômés.

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Executive Summary

This study examines the labour market outcomes of employment equity groups – visible minorities, Aboriginal people and the activity limited – compared to their peers in recent post-secondary graduating classes. The literature on this topic suggests that results and conclusions on whether or not labour markets systematically discriminate against equity groups depends heavily on selection of the sample and choice of regression techniques. The authors employ a variety of statistical techniques to a consistent sample to test whether there is some confluence among results that establishes a clear case for or against the existence of systematic differences in labour market outcomes between any of the groups and the remainder of the population.

The analysis yields the following tentative conclusions:

- Different statistical techniques yield (with one exception) similar conclusions for visible minorities, but inconsistent or otherwise inconclusive results for Aboriginal people and the activity limited. For visible minorities, the bulk of the statistical evidence rejects the hypothesis that there is no discrimination in labour markets against visible minorities.

- Raw or unadjusted indicators of employment and wage rates indicated that members of the targeted groups did not fare as well as their classmates in the labour market of the 1990s.

- Although the unadjusted earnings of visible minorities were equal to or slightly higher than average at some time points, the authors found evidence to suggest that visible minorities had greater endowments of characteristics in relation to rewards in the labour market. A number of different regression models pointed to earnings penalties for visible minorities in the range of one to ten percent, after controlling for other characteristics.

- Visible minorities were more concentrated in higher degree levels and fields of study that generally lead to better paying jobs, yet their average earnings did not reflect their higher qualifications.

- Earnings penalties for Aboriginal people and the activity limited estimated in the regression models were similar in scale (from one to ten percent) and their unadjusted earnings usually lagged the average as well.

- Reverse regression techniques estimate the earnings penalty among members of minority groups as it deviates from the market value of a fixed set of characteristics. Reverse regression estimates of the earnings differentials of up to 13 percent were noted in the cohort of 1990 graduates.

- The labour market disadvantages of the equity groups were not limited to earnings, but were also noted in employment rates. For each group and at every time point, employment rates

fell below the relevant class average. Among university graduates, employment rates were from one-half to three-and-a-half percentage points lower than the 1990 class average.

- Among community college graduates the employment rate differences were greater between various equity groups and other college graduates, ranging from two-and-a-half to nine-and-a-half percentage points.

- Selectivity-corrected earnings differentials were very similar to the uncorrected differentials estimated with the other regression techniques, though there were some substantial differences in the sources and magnitudes of selectivity between the minority and non-minority groups.

The results further confirm the notion that equally qualified minority group members are less likely than their classmates to find work. They also provide some evidence of earnings penalties among those members of equity groups who have found jobs. The results suggest that there is a pool of highly trained, but under-utilized graduates in Canada identifiable by their skin colour, Aboriginal heritage or activity limitations. On the one hand, the authors cannot not rule out the possibility that such persons face discriminatory practices in labour markets, even though they cannot observe it directly.

On the other hand, earnings differentials may be attributed to sources other than overt discrimination. Some of the social aspects of the labour market might put minority group members at a disadvantage, but would not usually be thought of as discrimination. For example, informal networks – the help and advice of family and friends – are an important source of potential employment contacts. Graduates from groups whose families are less likely to have post-secondary education or to live in Canada may have fewer opportunities stemming from informal networks.

There are potential benefits, on the individual level, of eliminating residual earnings differentials, and on a societal level, by making better use of human capital. How best to achieve these benefits and what costs society is willing to bear are issues for others to determine.

Sommaire

Cette étude examine la situation de groupes d'équité en matière d'emploi sur le marché du travail - minorités visibles, Autochtones et personnes à activité limitée - comparativement à leurs pairs issus de récentes promotions d'établissements d'enseignement postsecondaire. La documentation sur ce sujet laisse croire que les résultats et les conclusions sur l'absence ou non de discrimination systématique du marché du travail à l'égard de ces groupes d'équité reposent fortement sur le prélèvement de l'échantillon et le choix des techniques de régression. Les auteurs appliquent diverses techniques statistiques à un échantillon homogène afin de vérifier si une confluence des résultats établit clairement ou non l'existence d'écarts systématiques dans les résultats qu'obtiennent l'un ou l'autre de ces groupes sur le marché du travail par comparaison au reste de la population.

L'analyse arrive aux conclusions provisoires suivantes :

- Des techniques statistiques différentes produisent (à une exception près) des conclusions semblables pour les minorités visibles, mais des résultats incohérents ou autrement non concluants dans le cas des Autochtones et des personnes à activité limitée. Chez les minorités visibles, la plupart des statistiques réfutent l'hypothèse de l'absence d'une discrimination du marché du travail à l'égard des minorités visibles.

- Les indicateurs bruts ou non corrigés des taux d'emploi et de salaire indiquent que les membres des groupes ciblés n'ont pas fait aussi bien que leurs confrères de classe sur le marché du travail des années 90.

- Même si les gains non corrigés des minorités visibles étaient égaux ou légèrement supérieurs à la moyenne à certains moments dans le temps, les auteurs ont trouvé des cas qui laissent croire que les minorités visibles possédaient un bagage plus important de caractéristiques susceptibles de les avantager sur le marché du travail. Différents modèles de régression indiquent que les minorités visibles subissaient une pénalité de revenu de l'ordre de 1 % à 10 %, après avoir tenu compte des autres caractéristiques.

- Les minorités visibles se retrouvaient davantage à des niveaux et dans des domaines d'études supérieurs qui débouchent généralement sur des emplois mieux rémunérés, pourtant la moyenne de leurs revenus ne reflète pas leur qualification supérieure.

- Les pénalités de revenu chez les Autochtones et les personnes à activité limitée évaluées dans les modèles de régression affichaient la même envergure (de 1 % à 10 %), et leurs gains non corrigés étaient aussi habituellement moins élevés que la moyenne.

- Les techniques de régression inverse estiment la pénalité de revenu chez les membres des groupes minoritaires dans la mesure où elle s'écarte de la valeur marchande d'un ensemble

fixe de caractéristiques. Appliquées à la cohorte des diplômés de 1990, ces techniques ont révélé des écarts estimatifs de revenu allant jusqu'à 13 %.

- Les groupes d'équité n'ont pas été désavantagés seulement sur le plan des revenus mais aussi sur le chapitre des taux d'emploi. Pour chaque groupe et à chaque moment dans le temps, les taux d'emploi tombent sous la moyenne de la catégorie pertinente. Chez les diplômés d'université, les taux d'emploi ont été de un demi à trois points et demi inférieurs à la moyenne de la catégorie en 1990.

- Chez les diplômés de collèges communautaires, l'écart dans les taux d'emploi a été plus élevé entre les divers groupes d'équité et les autres diplômés de collèges, s'échelonnant de deux points et demi à neuf points et demi.

- Les écarts de revenu corrigés en fonction de la sélectivité ressemblaient énormément aux écarts non corrigés estimés avec les autres techniques de régression, même si l'on a observé des écarts notables au niveau des sources et de l'étendue de la sélectivité entre les groupes minoritaires et non minoritaires.

Les résultats confirment à nouveau l'idée que les membres de groupes minoritaires jouissant d'une qualification semblable sont moins susceptibles de trouver du travail que leurs collègues. Les résultats indiquent aussi une pénalité de revenu chez les membres des groupes d'équité qui ont trouvé du travail. Selon ces résultats, il semble y avoir au Canada un bassin de diplômés hautement qualifiés mais sous utilisés, identifiables par la couleur de leur peau, leur héritage autochtone ou une limitation d'activité. En revanche, les auteurs ne peuvent ignorer la possibilité que ces personnes font face à des pratiques discriminatoires sur le marché du travail, même s'ils ne peuvent les observer directement.

D'autre part, les écarts de revenu peuvent s'expliquer autrement que par une discrimination ouverte. Certains aspects sociaux du marché du travail risquent de défavoriser les membres des groupes minoritaires, mais on ne les qualifierait habituellement pas de pratiques discriminatoires. Par exemple, les réseaux informels, comme l'aide et les conseils de membres de la famille et d'amis, représentent une source importante de contacts potentiels en vue d'un emploi. Les diplômés appartenant à des groupes dont la famille est moins susceptible de posséder une instruction de niveau postsecondaire ou d'habiter au Canada ont moins d'occasions offertes par les réseaux informels.

Il y a des avantages éventuels, au niveau individuel, à éliminer les écarts résiduels de revenu, et au niveau de la société, à faire un meilleur usage du capital humain. La meilleure façon d'obtenir ces avantages et les coûts que la société est prête à assumer à cette fin représentent des questions que nous laissons à d'autres le soin d'examiner.

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1. Introduction

Fair or equitable treatment of individuals in the labour market is an important social and economic goal in Canadian society. Economic efficiency is enhanced when employers hire and pay workers according to productivity – the value they contribute to their organizations – and diminished when employers systematically underestimate or undervalue that contribution due to factors unrelated to performance such as ethnic origin, skin colour, or limitations unrelated to a particular job. In addition to these economic considerations, Canadian legislation reflects a general desire of the population to promote a just and fair society where access to the labour market is not obstructed by distorted or misconceived notions of who can and who cannot perform particular jobs or occupations. The federal Employment Equity Act of 1996 (and its predecessor of 1986), for example, embodies the goal of workplace equality for women, visible minorities, Aboriginal people and persons with disabilities in the Federal Jurisdiction and in the Federal Public Service.[1]

While there may be broad agreement in the goals of such policies, the implementation of such legislation is not costless since compliance requires resources both on the part of target organizations and government agencies charged with monitoring and enforcement. If there is no systematic discrimination in the labour market, or if the legislation is ineffective in dealing with the problems, these costs are not balanced or exceeded by economic or social benefits, and should be withdrawn or modified. For this reason, data that permit ongoing monitoring of labour market status of individuals within these designated groups over time are particularly valuable, allowing an assessment of the extent of any problems, and possibly some analysis of the impact of remedial legislation.

The National Graduates Surveys provides particularly useful data to track the performance of equity groups in comparison with the rest of the population over time. The NGS sample is

[1] The Act's purpose is "to achieve equality in the workplace so that no person shall be denied employment opportunities or benefits for reasons unrelated to ability and ... To correct the conditions of disadvantage in employment experienced by women, Aboriginal people, persons with disabilities and members of visible minorities by giving effect to the principle that employment equity means more than treating persons in the same way but also requires special measures and the accommodation of differences." Source: Treasury Board of Canada Secretariat, "Overview of the Employment Equity Act (1996) from a Public Service Perspective," Government of Canada, October 1996, http://www.tbs- sct.gc.ca/pubs_pol/hrpubs/TB_852/OVER_e.html

limited, however, to those who have graduated from Canadian universities, colleges, or trade and vocational schools. This limitation of the sample is both a strength and a weakness. A weakness is that the sample says little about the economic outcomes of equity groups within the general population. A strength is that NGS sample is relatively homogeneous in educational attainment and quality, key determinants of labour market outcomes.

This study has two purposes: first, to present evidence from the labour market on the current state and recent changes in the employment and earnings of equity groups relative to the rest of the graduate population; and second, to examine the consistency across regression models of differences in earnings between employment equity groups and the general population. A full analysis of labour market experiences of equity groups would include the ability to find employment as well as the quality of that employment as measured by earnings. Given the scope and detail in this investigation of earnings differentials of equity groups, however, we leave exploration of differences in employment and participation rates for further analysis.

In general, we find some evidence of earnings disparities for equity groups in Canada. This finding tends to be larger and more reliable among equity group members who are college graduates rather than university graduates. The confidence we can place in these conclusions varies greatly, however, with the type of model employed.

We begin with a brief review of the most recent literature on labour market outcomes of equity groups in Canada, followed by a general discussion of the methodological issues associated with models to test employment or earnings discrimination. We then present tables describing the measured labour market outcomes of equity groups among the graduate populations. Finally we use several regression models to determine what proportion of these raw differences could be associated with discrimination in the labour market.

2. Literature Review

The economic literature on wage discrimination associated with minority groups is now very extensive, though recent studies based on Canadian data are relatively scarce. In spite of many studies, however, very little in the way of firm conclusions can be drawn on whether labour markets in North America systematically discriminate against members of equity groups. Part of the difficulty in reaching substantive conclusions on discrimination issues rests with an appropriate interpretation within the framework of the models employed.

A previous paper co-authored by one of the present authors (Wannell and Caron, 1994a) used NGS data to examine the question of possible wage discrimination for employment equity groups – visible minorities, Aboriginal people and the activity limited[2] – relative to the rest of the population. Differences in employment rates of visible minorities relative to the rest of the labour force were also examined. The principal results showed that, among 1990 post-secondary graduates, all three groups had similar earnings in 1992 as the employed population as a whole, while their employment rates were uniformly lower.

In the context of the traditional model of *wage* discrimination, these results would indicate an absence of such discrimination. In a broader labour market context, however, the lower participation rates and higher unemployment rates found among these groups relative to the population, coupled with adjusted earnings about equal to those of the population, may be consistent with a conclusion that discrimination does exist. Employers may be more selective in dealing with applicants from employment equity groups, that is, employment equity group members must have higher productivity than others to be hired. If their wages were set according to job requirements rather than productivity, we would expect that, in the presence of unobserved correlates of productivity, employment rates of employment equity group members would be lower, but their adjusted earnings would be about the same as those of the population.[3]

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2 As explained further on page 15, the term activity limited is used rather than persons with disabilities due to the substantial difference between the Health and Activity Limitation Survey and the National Graduates Surveys definitions.

3 Other reasons for the lower labour force participation and higher unemployment rates among employment equity groups can be found in the discussion of results in Wannell and Caron (1994a).

The recent literature on earnings differentials for visible minorities does not provide strong evidence either for or against wage or employment discrimination. Christofides and Swidinsky (1994) used the 1989 Labour Market Activity Survey to find that visible minorities earn significantly lower wages relative to whites after adjusting for endowment differences, but their analysis does not adjust for possible differences in the quality of education.

More recently, de Silva (1997) used 1991 Census data to compare the earnings of visible minority men with those of their white counterparts. The author finds that there is a 32 percent differential in earnings between visible minorities and whites, but that most of this differential can be explained by differences in endowment, and the quality of education and experience. "The main message of the study is that a large portion of what is often believed to be discrimination turns out in the final analysis to be mainly a reflection of differences in the quality of education and experience between visible-minority men and their white counterparts."[4]

Hum and Simpson (1998) worked with data from the Survey of Labour and Income Dynamics (SLID) to investigate wage discrimination against visible minorities. They found that, with the exception of Black men, there is no statistically significant wage disadvantage for members of visible minorities who are native born. Their conclusion is that wage differentials exist primarily among immigrants.

This study updates and extends the work of Wannell and Caron (1994b) by using several econometric techniques and newly available panels of the NGS to re-examine the wage and employment experience of the employment-equity groups in relation to the general population.

[4] de Silva (1997), p. 35.

3. Multivariate Analysis in Testing for Discrimination

The literature on economic discrimination is fraught with controversy, stemming in part from the fact that most studies have been based on a single model incorporating a particular set of restrictive assumptions. In the most common application of multivariate tests for earnings discrimination, the conventional wage or earnings equation is employed. A series of measures of the individual characteristics pertinent to productivity are used as regressors. These variables may either be supplemented by a dummy variable to test for a fixed absolute or proportional penalty borne by members of the sub-population being discriminated against, or two complete sets of coefficients may be estimated to test for differences in the rewards associated with all characteristics.

There are at least three interrelated sources of problems confounding the results of such tests of discrimination:

- *censoring*: lack of observations on wages of the non-employed leads to potential bias and inefficiency of estimates of single equations;[5]
- *selection*: those not employed may have a lesser taste for employment, or lesser labour market skills, or both, yielding results which are biased with respect to behavioural parameters estimated for the population as a whole;[6] and
- *omitted variables*: no list of survey-derived variables is likely to capture accurately all the dimensions contributing to productivity. Such omissions lead to biases in the estimated parameters representing discrimination effects. The problem of selection can also be viewed as an omitted variables problem, since observations on those persons not employed do not include positive wage or earnings values.[7]

As a consequence of these problems, the models may not be able to offer definitive results on the several hypotheses raised in the literature, including differing distributions of productivity among

5 See for example, Maddala (1983), Ch. 6.

6 See Maddala (1983), Ch. 9.

7 See for example, Berndt (1991), among others.

the sub-populations, differences in labour supply elasticities, and discrimination being viable in non-competitive industries.

Most data sources on earnings are subject to these problems, and the data from the National Graduates Surveys used for this paper are no exception. In particular, NGS data are subject to these issues in the following ways:

- omitted variables include, prominently, measures of quality of education and of intelligence, ability, or skills. The NGS carries no measures of the quality of education, and few and only very indirect measures of intelligence, ability or skills;
- selection bias in comparisons over time, resulting from attrition associated with loss of observations in the second wave because respondents are not locatable;
- accretion, the reverse of the above, resulting from the completion of higher degree and entry to the labour force and/or full-time employment; and
- numbers of observations are sometimes small, especially for the aboriginal and activity limited populations.

Both attrition and accretion may lead to biased results. Attrition in the samples used in this study is probably the more significant problem, both in terms of numbers involved and of available remedies, than is accretion.[8]

The problem of small numbers is endemic to studies of this type, which require comparisons between the majority population and a series of much smaller groups. Based on the experience reported in Wannell and Caron (1994a), among others, specific models may be expected to yield inconclusive results, especially for the very small populations in the sample such as Aboriginal people and the activity limited.

3.1 Ordinary Least Squares with Dummy Variables

The most restrictive model testing for possible discrimination, a single equation for the entire population including a dummy variable for visible minorities, constrains the coefficients on the individual productivity-related variables to be identical for the two populations. The

[8] See Vella (1998) for a recent survey.

discrimination effect on wages or earnings is estimated by the coefficient on the additive dummy variable, and is interpreted as the difference in the intercept terms for the two populations. In other words, all other coefficients in the earnings equation are constrained to be the same for the two populations. This means, for example, that the returns to education are assumed or required to be the same for both equity groups and the rest of the population.

Variants of this model involve relaxing these restrictions for some or all of the coefficients on the explanatory variables in the earnings equation. Johnson and Stafford (1974), and Hirsch and Leppel (1992) assumed that some regressors had a common set of coefficients while a subset of variables selected a priori interacted with the sub-population dummy variable. Link and Ratledge (1975) estimated separate regression equations for the two groups, calculating estimates of the earnings-equivalence of discrimination evaluated at the respective group means.

We run OLS regressions as a starting point for determining what portion of earnings differentials could be attributed to discrimination in the Canadian labour market, ignoring for the moment, potential problems in the data that violated the underlying assumptions of the OLS model.

3.2 The Jackson-Lindley Approach

The most common model employed for estimating the extent of wage or earnings discrimination was developed by Blinder (1973) and by Oaxaca (1973).[9] The model has replaced the simple dummy variable approach in most of the literature since its publication in 1973. Briefly, the model is a wage or earnings equation of conventional log-linear form:

$$Ln(Y) = \beta X \qquad (1)$$

where Y represents the wage rate or earnings, X is a vector of variables representing individuals' productivity-related characteristics (years of schooling, experience, etc.) and ß is a vector of coefficients. If least squares estimates are derived by applying the equations separately to the "advantaged" and the "disadvantaged" groups, the difference in log of earnings may be decomposed into the effect of the difference in characteristics, weighted by the coefficients, and the difference in coefficients applied to the mean values of the characteristics. Thus, the portion

[9] See Berndt (1991, pp. 182-184) for a more detailed account.

of differences in wages resulting from differences in characteristics may be "netted out", leaving a pure discrimination effect, resulting from differences in rewards accorded by employers to the two populations for the various characteristics contributing to productivity.

There is an index-number type of problem associated with this procedure, stemming from the fact that each of the two populations has its own set of coefficients and of mean values on the individual characteristics. Thus, two different estimates of the difference in log earnings may be calculated from a single data set.

A procedure applied by Jackson and Lindley (1989) circumvents this problem by interacting the characteristics of the "disadvantaged" population with a dummy variable within an equation for the population as a whole. That formulation was employed in Wannell and Caron (1994a). Like Blinder-Oaxaca, the Jackson-Lindley approach employs a model which partitions the differences between disadvantaged groups and the population into differences in characteristics governing earnings and differences in market values of those characteristics. But the model includes, among the regressors, a "pure" magnitude attributable to discrimination in the form of the dummy intercept term.[10]

3.3 Heckman Procedure

The Heckman procedure deals with the problem of censoring or non-randomly missing data. If discrimination exists, or is perceived by potential entrants to exist, the rates of labour force participation and employment as well as the wage level may be affected. In relation to labour supply, especially of women, there is a massive literature on this issue and its implications for estimating earnings equations. If there is this censoring of the data, the error terms of the OLS equation cannot be assumed to be distributed normally and the coefficient estimates will be biased.

A number of proposed techniques have emerged which are relevant to the problem of estimating discrimination against minority groups. Some of these are analogous to the one-step models described above. What have been described as "second generation studies" go beyond these

[10] Although Jackson and Lindley regard the minority group intercept as a more-or-less "pure" indicator of discrimination, it should be noted that it also includes the effects of differential rewards to the omitted category in each set of dummy variables included in the regression.

models in treating explicitly utility functions and unobservable variables and in dealing with the problems of censoring, selection and omitted variables.[11]

Only one of these "second generation" models – which is by far the most commonly employed in recent published research – will be employed in the present study. The model devised by Heckman (1979) involves the estimation of an equation of the probability of being in the labour force based on a number of determinants. The "inverse Mills ratio" is calculated from the distribution of the error terms from the probit equation estimation, and is then included as a regressor in a conventional ordinary least squares regression equation to explain earnings. In our case, the probit, or selection equation is based on employment versus non-employment (unemployment and out-of-labour-force), and we test for the presence of selectivity bias.[12]

3.4 Reverse Regression

An alternative to either of these models is one in which discrimination is viewed, not as lower earnings for members of the "disadvantaged" population when differences in characteristics have been accounted for, but in terms of the additional productivity that a member of that population must have to obtain the same earnings.

This alternative model has led to a procedure known as "reverse regression" in which the positions of earnings and productivity characteristics are reversed in their roles as dependent and independent variables in relation to the conventional "forward regression."[13] For estimation, the dependent variable is constructed as the weighted sum of individual characteristics, the weights being the estimated coefficients from the forward regression. By employing both forward and reverse regressions, it is possible to calculate alternative estimates of the extent of discrimination in the dimension of earnings. It is suggested that these estimates bracket the true value, which lies somewhere between them.

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[11] See Berndt (1991), pp.617ff. And Killingsworth (1983), Ch.4.

[12] See, e.g., Dolton and Makepeace (1987) for additional clarification on interpreting results from this procedure.

[13] See Link and Ratledge (1975), p. 191 and Maddala (1983), p. 459.

Advocates of reverse regression point out that, since the explanatory variables in forward regressions, such as years of education and work experience are frequently difficult to measure accurately, it is better to employ such measures as dependent variables. Goldberger (1984) has shown that, under appropriate assumptions on causal structure, reverse regression may be appropriate. Moreover, Racine and Rilstone (1995) showed in a recent study using Canadian data that apparent inconsistencies in direct and reverse regression results could be eliminated by means of a non-parametric procedure.

3.5 Fixed Effects

The fixed effects model deals with the problem of unobserved characteristics such as ability or quality of education in wage or earnings equations. The model allows the investigator to eliminate the impact of these unobserved variables by taking advantage of panel data that include multiple observations on individuals over time, such as those produced by the National Graduates Surveys. Briefly, the model is based on differences over time in a basic, static model such as the conventional wage equation.[14] The unobserved individual characteristics are assumed to remain constant in magnitude between the adjacent points in time. They are "netted out" of the equation and we are left with the effects of changes in measured variables on changes in the dependent variable.[15]

[14] Since expositions of the fixed effect model are not readily accessible, even in some prominent current econometrics textbooks, a more detailed explanation of the method is given in Appendix A. Griliches et al. (1978) and Chamberlain (1978) do, however, include discussions of fixed effects in the treatment of the omitted variables problem.

[15] See Jakubson (1986a and 1986b).

4. Data, Concepts and Definitions[16]

This study uses data from three panels of the National Graduates Surveys (NGS), which gathers data on characteristics and labour market information from graduates of Canadian universities, colleges and trade/vocational schools. We build on previous work on labour market experiences of employment-equity groups – visible minorities, aboriginals, and the activity-limited – that was based on the 1992 National Graduates Surveys of 1990 graduates of university, college, vocational and technical schools. In this study, we provide both a longitudinal view, by comparing the experiences of 1990 graduates from employment-equity groups between two and five years after graduation, as well as a cross-sectional view by comparing the experiences of the 1990 and 1995 cohorts two years after graduation.

The National Graduates Surveys

The National Graduates Surveys (NGS), sponsored by Human Resources Development Canada and conducted by Statistics Canada, are specifically designed to obtain information on the relationship between education/training and labour market activities, the long-term labour market experiences of graduates, the employment, earnings, occupation and additional educational experiences and qualifications of graduates. The NGS focus on individuals who had obtained a degree, diploma or certificate from a trade/vocational school, a career/technical college (or CEGEP) or a university, and who were still living in Canada at the time of the survey. The NGS files are representative of the underlying graduate population in Canada.

Background

Statistics Canada conducted a first survey in 1978 on the labour market experiences of 1976 graduates from universities and community colleges in Canada. In 1984, a similar survey, the NGS of 1982 graduates was sponsored jointly by the Department of the Secretary of State and Employment and Immigration Canada and conducted by Statistics Canada. This survey expanded on the content of the previous survey and extended the population base to include graduates of trade/vocational programs in addition to graduates from community colleges and universities.

Since 1982, four cohorts of graduates have been surveyed. Every cohort was interviewed two and five years after graduation.

Year of graduation	First interview	Follow-up interview
1982	1984	1987
1986	1988	1991
1990	1992	1995
1995	1997	2000

The 2000 Follow-up Survey of the 1995 Graduates included a 'brain drain' component. Those who graduated in 1995 but who were living in the United States in June 2000 were included in the survey.

[16] The discussions in this section are largely those found in Wannell and Caron (1994a).

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[16] The discussions in this section are largely those found in Wannell and Caron (1994a).

Objectives

The survey's key data objectives are:

- To obtain information for labour market analysis;
- To obtain information on the relationship between education/training and labour market experiences and the exposure of graduates to additional learning opportunities;
- To extend available information required to improve occupational supply and demand projection models and to conduct related studies of supply-demand imbalances in the labour market;
- To extend available information required to improve occupational supply and demand projection models and to conduct related studies of supply-demand imbalances in the labour market;
- To obtain data regarding longer-term market experiences of graduates;
- To obtain information on labour market experiences of members of target groups (such as women, visible minorities, native people, and persons with disabilities);
- To gain a better understanding of school-work transitions and returns to human capital;
- To gain a better understanding of post-secondary education financing;
- To obtain more detailed information on knowledge and skills.

Methodology

The National Graduates Surveys were based on a stratified systematic random sample design. For each province, the graduate population was stratified into five education levels: trade/vocational (skilled trades), career/technical (college), undergraduate, master's level and doctorate. The levels were subsequently stratified into nine fields of study for those who had taken a college program and ten fields for trade/vocational and university graduates. These fields of study classifications were based on the 5-digit USIS (University Student Information System) and CCSIS (Community College Student Information System) codes used by Statistics Canada. The sample allocation to the strata was made to assure acceptable levels of detail and therefore acceptable data reliability for the provinces, education levels and fields of study.

A total sample was selected for every cohort of graduates. Interviewers attempted to contact all graduates in the sample, initially using the telephone numbers provided by their institution. On average for every cohort, 73% of the total sample selected were contacted and interviewed. The same individuals were contacted again for the follow-up interview.

Year of graduation	Total sample selected	Year of survey	Usable sample (response rate)
1982	49,150	1984	35,717 (73%)
		1987	31,167
1986	53,136	1988	40,814 (77%)
		1991	35,401
1990	51,111	1992	36,280 (71%)
		1995	35,816
1995	61,759	1997	43,040 (70%)
		2000	To be completed

For more detailed information on methodology, see:

Clark, Warren, Margaret Laing and Edith Rechnitzer (1986). *The Class of 82: Summary Report on the Findings of the 1984 National Survey of the Graduates of 1982*, Secretary of State and Statistics Canada.

Clark, Warren (1991). *The Class of 1986: A Compendium of Findings of the 1988 National Graduates Surveys of 1986 Graduates with Comparisons to the 1984 National Graduates Surveys*, Employment and Immigration Canada and Statistics Canada, Catalogue LM-198E92.

Little, Don and Louise Lapierre (1996). *The Class of 90: A Compendium of Findings from the 1992 National Graduates Surveys of 1990 Graduates*, Human Resources Development Canada and Statistics Canada, Catalogue SC-125-12-96E.

Taillon, Jacques and Mike Paju (1999). *The Class of '95: Report of the 1997 National Survey of 1995 Graduates*, Human Resources Development Canada and Statistics Canada, Catalogue SP-121-04-99.

Throughout our analysis of earnings, we exclude graduates who have any of the following characteristics in the year of observation: the self-employed, those earning less than $5000, or who are in school full time.[17]

Following Wannell and Caron (1994a), we group graduates of colleges with those earning certificates from trade/vocational schools throughout this analysis, using the "college" designation to refer to both groups combined. Similarly we include all persons earning bachelor, master, and doctoral degrees into a single group designated as university graduates. These groupings allow some separate analysis by broad types of education, while avoiding splitting the sample so finely that the already significant problem of small sample sizes is made even worse.

The question of whom to include in each of the designated groups is addressed in the Employment Equity Regulations that accompany the Employment Equity Act of 1986.[18] Although this Act and the prescribed methodologies used to identify members of target groups were updated in 1996, the earlier legislation was in effect at the time of the 1992 NGS when the identification information was collected. The 1986 regulations outline the following concepts:

- ***Visible Minorities*** - persons, other than Aboriginal people, who are non-Caucasian in race and non-white in colour.

[17] An examination of the industry and occupation of workers earnings earning less than $5,000 per year suggested that most of these cases are coding errors. Less than one percent of all graduates were excluded on this basis.

[18] The Interdepartmental Working Group on Employment Equity Data, 1993.

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Clark, Warren, Margaret Laing and Edith Rechnitzer (1986). *The Class of 82: Summary Report on the Findings of the 1984 National Survey of the Graduates of 1982,* Secretary of State and Statistics Canada.

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[18] The Interdepartmental Working Group on Employment Equity Data, 1993.

- ***Aboriginal people*** - persons who are Indians, Inuit or Metis.
- ***Persons with Disabilities (or Activity Limited)*** - persons who:
  - have any persistent physical, mental, psychiatric, sensory or learning impairment;
  - consider themselves to be, or believe that an employer or a potential employer would be likely to consider them to be, disadvantaged in employment by reason of an impairment referred to in subparagraph above.

The concepts outlined in the regulations are operationalized by an Interdepartmental Working Group on Employment Equity Data. Data on visible minorities and Aboriginal people come from the Census of the Population, while data on persons with disabilities come from the Health and Activity Limitation Survey (HALS), Statistics Canada (1993).

Visible minorities are identified primarily by the Census ethnicity question. This question asks: "To which ethnic or cultural group(s) did (the respondent's) ancestors belong?". The Working Group has prepared a list of responses that corresponds as closely as possible to the conceptual definition. Note that respondents may provide more than one ethnicity response – this is termed multiple response. In the case of multiple response, a person is classified as a member of a visible minority if any of their responses matches one on the list. The ethnicity information is supplemented by information on places of birth (e.g. Haiti) or first languages (e.g. Hindi) that likely indicate visible minority status.

Aboriginal people are similarly identified by the Census ethnicity question. Thus any single or multiple response referring to North American Indian, Inuit, Métis or a specific First Nation or band name leads to an Aboriginal people designation.

As noted above, persons with disabilities are identified through HALS. HALS is a post-censal survey of census respondents designed to collect data on the nature and severity of disabilities, as well as the problems associated with disabilities. HALS disability status is determined through a sequence of approximately 15 questions. The HALS sample is partially stratified according to a screening sequence of four questions on the Census of the Population. Approximately 20 percent of those identified as potentially disabled by the Census screening sequence fail to conform to the

HALS disability definition. Conversely, about five percent of those who answer no to all the Census screening questions are subsequently identified as disabled by HALS.

The questions used to identify designated group status on the 1992 and 1997 National Graduates Surveys do not conform precisely to the operational definitions as outlined by the Interdepartmental Working Group. One difference relates to the wording of the NGS ethnicity question. While the Census question asks about the cultural or ethnic background of the respondent's ancestors, the NGS question asks about the background of the respondent. Overall, this apparently minor difference has a large impact on the level of multiple ethnicity response -- 18 percent in the NGS compared to 32 percent for a similar group of Census respondents.[19] Paradoxically, the multiple response rate is higher for visible minorities in the NGS (16 percent) than in the Census (13 percent).

The other difference between the Census and NGS coding of visible minority status is in the use of country of birth and mother tongue to supplement the ethnicity question. As noted above, the Census uses these variables to pick up some visible minority members who may be missed by the ethnicity question. This option is not available on the NGS since mother tongue is not captured at a detailed level for languages other than English or French and place of birth is not captured at all. Since these steps account for some five percent of the visible minorities identified in the Census, NGS estimates of visible minority representation are likely lower by a similar factor.

With respect to persons with disabilities, the NGS uses the four Census screening questions rather than the much longer HALS screening sequence. While this makes sense in the context that the NGS was already a very long survey, it leads to estimates of persons with disabilities that would differ substantially from the official HALS definition. In recognition of this difference, we use the term activity limited in this paper rather than persons with disabilities.

[19] The Census comparison group consists of university and community college graduates reweighted to have approximately the same age distribution as the NGS respondents

5. Representation, Participation and Employment Rates

Before proceeding with the econometric tests of the discrimination, we present a series of cross tabulations that summarize what the raw data tell us about the observed differences between the visible minority populations and their counterparts in the rest of the population. We split the sample into two groups: University graduates and College graduates. University graduates include persons receiving Bachelor, Master, and Doctorate degrees. College graduates include graduates from trade and vocational schools and programs.

One of the potential difficulties in dealing with longitudinal data such as the NGS is the problem of attrition – the loss of original respondents through subsequent waves of the survey. In Appendix D, we analyze and test for the effects of attrition. Our conclusion is that attrition has negligible effects on earnings comparisons.

In this section we present cross-tabulations describing labour market activities of university and college graduates who are members of equity groups.

5.1 Representation Rates

Analysis of representation rates permits some sense of how designated group graduates are distributed across various levels and fields of study, and regions of the country. Important differences in these distributions illustrate the importance of controlling for these characteristics in assessing whether or not there is evidence of discrimination in earnings patterns.

5.1.1 University Graduates

The designated group representation rates, shown in Table 1, are calculated by dividing the number in the designated group by the total population. Item non-responses, responses for which the designated status is unknown, and instances where the ethnicity is 'other' are excluded from both the numerator and the denominator in these calculations.

Some 8.2 percent of 1990 university graduates are identified as visible minorities in 1995, a decrease from the 1992 representation rate for the same cohort of 9.4 percent. This decline signals a greater attrition rate among the visible minorities in the sample than among the university graduate sample as a whole. As discussed in Appendix D, some of this relatively high

attrition rate may be due to the fact that visible minority students are more likely to be visa students who come to Canada from other countries to study. These students may be more likely to leave the country at some point after their studies and would consequently be dropped from the sample. Attrition rates among visa students are estimated at over 50 percent, but because of inconsistencies in identifying visa students in various jurisdictions and institutions, attempting to exclude them from the analysis is likely to cause more problems than it would solve.[20]

Table 1 University Graduate Employment-Equity Group Representation Rates, 1992, 1995 (1990 Cohort) and 1997 (1995 Cohort)

	Visible Minorities			Aboriginal people			Activity Limited		
	1992	*1995*	*1997*	*1992*	*1995*	*1997*	*1992*	*1995*	*1997*
Number in Equity Group (000s)	11.9	10.0	16.4	1.6	1.5	1.5	4.8	5.0	6.9
Total Number of Graduates (000s)	126.0	122.2	157.1	126.0	122.2	157.1	126.0	122.2	157.1
Equity Group Representation Rate (%)	9.4	8.2	10.4	1.2	1.2	0.9	3.8	4.1	4.4
Degree Level									
Bachelor / 1st Professional Degree	8.9	7.9	9.9	1.4	1.3	1.0	3.9	4.0	4.3
Master	11.4	9.4	12.5	0.6*	0.5*	0.5*	3.5	4.4	4.7
Doctorate	17.0	14.3	24.1	---	---	---	3.0	4.1	5.1
Field of Study									
None/Unknown	9.8	9.1	10.0	2.1*	---	1.0*	4.8*	4.6*	6.0*
Education	3.7	3.6	4.4	1.7*	1.8*	1.4*	3.5	4.7	4.8
Fine Arts & Humanities	7.0	6.3	7.3	1.2*	1.4*	---	5.1	5.4	4.9
Commerce, Economics & Law	9.5	7.7	12.7	---	---	---	3.3	2.8*	2.4*
Other Social Sciences	6.9	5.9	8.1	1.9	1.7*	1.4*	4.9	5.7	6.1
Agricultural & Biological Sciences	14.8	12.8	14.8	0.8*	---	0.6*	2.2*	2.5*	4.4
Engineering	18.7	16.6	19.3	0.9*	---	---	2.2*	1.8*	2.8*
Medical & Other Health	12.9	11.1	13.1	1.0*	0.8*	---	4.4	4.2*	4.0
Math & Physical Sciences	18.1	16.1	24.5	---	---	---	3.3	2.1*	3.5*
Province / Region									
Atlantic Provinces	3.3	2.7	2.8	1.1*	1.1*	1.4*	4.5	4.6	6.5
Quebec	6.8	5.6	5.7	1.0*	1.1*	—	2.5	2.4	2.3
Ontario	11.1	9.6	12.7	0.8*	0.9*	—	3.7	4.0	5.0
Manitoba	7.9	7.2	8.1	3.2*	2.9*	2.6*	6.0	5.2	4.3
Saskatchewan	4.1*	2.5*	7.3*	5.8	4.9*	4.3	4.9	7.0	6.1
Alberta	9.8	8.8	11.5	1.7*	1.4*	1.4*	6.3	5.6	6.1
British Columbia & Territories	14.7	13.3	23.5	1.0*		---	4.1	4.9	4.9

Note: Asterisk (*) stands for less reliable data, with a coefficient of variation (CV) between 16 and 33 percent.
Dashes (---) indicate data that cannot be reported because the CV is above 33 percent.

[20] Visa status is derived from data reported by educational institutions and is not verified with individual respondents. Quebec institutions do not report any information on visa status and reporting in other jurisdictions appears to vary by institution. Additional research on the quality of the visa status variable is required.

Visible minority university graduates are relatively highly represented among earners of post graduate degrees – ranging from 8 to 10 percent at the undergraduate level to 14 to 24 percent at the PhD level in the various years of observation. Visible minorities are far more prevalent in natural sciences and engineering than in the arts and social sciences. The visible minority representation rate, in general, rises from east to west, broadly reflecting settlement patterns of recent immigrants and the distribution of visible minorities across the country. Representation rates range from roughly 3 percent in the Atlantic Provinces, to a high of nearly 24 percent in British Columbia in the 1997 survey of 1995 graduates.

Representation rates of Aboriginal people among university graduates remained stable at 1.2 percent, between 1992 and 1995, indicating that attrition in the sample of aboriginals is comparable to the rest of the university population. In 1997 data for 1995 graduates, however, the aboriginal representation rate dropped to 0.9 percent.

The aboriginal population in post-graduate studies is too small to permit reliable estimates. Similarly, small sample sizes make it difficult to offer reliable regional representation rates among Aboriginal people, but there is some indication of relatively high representation rates in the prairie provinces.

Representation rates of the activity limited grew from 3.8 percent to 4.1 percent between 1992 and 1995 indicating a lower than average rate of attrition. Among the activity limited there is some evidence of rising representation rates by degree levels over time. In the 1992 survey of the 1990 cohort, representation rates declined with higher degrees, but rose with the 1997 survey of 1995 graduates. Representation rates among the activity limited are higher in social sciences, education and the fine arts and humanities. Representation rates of the activity limited are lower than average in Quebec, and highest in the Atlantic provinces, followed by Saskatchewan and Alberta.

5.1.2 College Graduates

Representation rates of visible minorities among college graduates are somewhat lower than among university graduates, while rates are generally higher among aboriginals and the activity limited. Representation rates among the designated groups tend to be higher in Trade certificates

and diplomas compared to College certificates and diplomas, the sole exception being visible minorities in 1997.

Comparing the 1990 and 1995 graduate cohorts in the 1992 and 1997 surveys shows a substantial decline in representation rates of visible minorities and aboriginals in the college programs, falling from 8.7 percent to 6.7 percent for visible minorities and from 2.8 percent to 2.3 percent for aboriginals. In the case of visible minorities, some of this decline is compensated by increased representation rates in the university population, but for aboriginals the representation rate in the university population also fell between the 1990 and 1995 cohorts. Assuming no large change in the proportion of aboriginals in the 18 to 24 year old age group, the implied decline in post-secondary enrolment or completion among aboriginals should be investigated further.

Patterns in fields of study for visible minorities in college programs, are similar to those for university programs, with relatively high representation in engineering and other math related fields. Again, small sample sizes among the aboriginal population make it difficult to draw conclusions about field of study patterns and trends. Among the activity limited, however, the 1997 observation on the 1995 cohort indicates a remarkable tightening of representation rates around the overall average for all fields of study, with no representation rates straying more than one percentage point from the overall representation rate of 7.1 percent. This reflects a substantial growth in representation rates in Health Sciences, Natural Sciences and Management and Administration.

Representation rates by region are broadly similar to the patterns seen among University graduates. Visible minorities are relatively rare in the Atlantic Region and more prevalent in British Columbia. Aboriginal college graduates are more prevalent in the Western Provinces. Ontario and the Western Provinces have relatively high representation rates of the activity limited among college graduates.

Table 2 **College Graduate Employment-Equity Group Representation Rates, 1992, 1995 (1990 Cohort) and 1997 (1995 Cohort)**

	Visible Minorities			Aboriginal people			Activity Limited		
	1992	*1995*	*1997*	*1992*	*1995*	*1997*	*1992*	*1995*	*1997*
Number in Equity Group (000s)	8.7	7.8	9.4	2.9	2.5	3.2	6.6	7.8	10.0
Total Number of Graduates (000s)	100.6	99.8	140.7	100.6	99.8	140.7	100.6	99.8	140.7
Equity Group Representation Rate (%)	8.7	7.8	6.7	2.8	2.5	2.3	6.5	7.8	7.1
Degree Level									
Trade Certificate / Diploma	9.6	8.8	6.3	3.9	3.3	2.3	8.6	10.3	7.3
College Certificate / Diploma	8.0	7.1	7.0	2.1	2.0	2.2	4.9	5.8	7.0
Field of Study									
Arts & Humanities	8.6	8.5	9.0	3.1	3.1	2.1*	7.6	9.7	7.5
Health Sciences	7.9	6.0	7.1	1.5*	1.4*	2.0*	4.2	5.0	6.9
Other Engineering Technology	11.0	8.3	6.0	1.8*	---	1.8*	6.0*	4.3*	6.6
Electronics, Math & Computer Science	14.6	12.6	8.9	1.2*	---	0.9*	5.6	4.9*	7.0
Mechanical & Structural Engineering Technology	8.0	6.2*	3.5	3.9*	2.5*	2.5	7.5	4.4*	6.5
Natural Sciences & Primary Industries	2.2*	1.8*	1.9*	3.6*	1.9*	2.0*	3.7*	4.5*	7.1
Social Sciences & Services	5.2	5.3	4.4	4.1	3.4*	3.4	6.9	8.5	7.9
Secretarial Sciences & Merchandising	11.3	6.6*	7.8	3.1*	---	2.8	6.5*	2.5*	7.2
Management & Administration	9.5	7.9	8.6	2.4*	2.3*	2.1	5.1	6.2	6.6
Province / Region									
Atlantic Provinces	1.0*	1.3*	1.3	1.8	1.7	2.6	6.3	6.3	6.9
Quebec	4.6	3.7	4.3	1.7*	1.5*	0.8*	3.1	3.6	4.4
Ontario	11.4	10.3	7.3	2.4	2.3	1.8*	6.3	8.4	8.2
Manitoba	6.6	5.6	6.1	6.9	6.4	7.9	9.4	9.8	9.7
Saskatchewan	1.5*	1.4*	1.6*	7.3	6.6	7.1	5.9	8.4	9.8
Alberta	8.0	6.9	8.3	4.6	3.7	3.4	9.2	10.8	9.2
British Columbia & Territories	13.8	12.7	15.5	3.1	2.6*	4.4	9.0	9.6	9.3

Note: Asterisk (*) stands for less reliable data, with a coefficient of variation (CV) between 16 and 33 percent.
Dashes (---) indicate data that cannot be reported because the CV is above 33 percent.

5.2 Labour Force Participation Rates

Tables 3 and 4 present labour force participation rates for equity group members who graduated from university and college programs in 1990 or 1995. Participation rates for Employment Equity groups are calculated by dividing the sum of employed plus unemployed within each group by the population of that group. Respondents for whom the labour force status or designated group status is unknown are not included in the calculations.

5.2.1 University Graduates

Broadly speaking, participation rate differences between equity groups and the total population are rather small, though there is some indication of a growing gap among the activity limited. Whereas the gap in participation rates between the activity limited and the total population was 3 percentage points in 1992, this gap had grown to 7 percentage points with the 1997 observations on the 1995 cohort. Differences in participation rates do not necessarily indicate difficulties in entering the labour market. Those designated as not participating in the labour market may be discouraged job seekers, but other reasons for non-participation may exist, including pursuit of post-graduate studies, among others.

Among university graduates, participation rates for visible minorities and the activity limited tended to fall below those for the total graduate population, while rates for aboriginal graduates were above the overall average.

Table 3 **University Graduate Employment-Equity Group Participation Rates, 1992, 1995 (1990 Cohort) and 1997 (1995 Cohort)**

	Visible Minorities			Aboriginal people			Activity Limited			Total Population		
	1992	*1995*	*1997*	*1992*	*1995*	*1997*	*1992*	*1995*	*1997*	*1992*	*1995*	*1997*
Overall Participation Rate	88.3	94.8	86.3	95.0	95.9	92.1	89.4	90.4	83.6	92.5	94.7	90.7
Overall Enrolment Rate	7.7	0.1	0.1	3.2	0.3	0.0	3.6	4.3	0.0	4.6	0.1	0.0
Gender												
Male	87.0	94.0	85.4	97.6	92.9	91.5	91.4	94.7	81.6	92.8	96.1	90.1
Female	89.7	95.8	87.3	93.6	97.3	93.6	87.9	87.9	86.7	92.4	93.5	91.5
Province / Region												
Atlantic Provinces	84.2	92.0	89.5	100.0	100.0	93.9	91.1	91.4	87.8	93.3	94.3	89.9
Quebec	86.9	94.4	85.4	90.8	93.9	68.0*	86.7	95.6	87.3	91.9	94.7	91.6
Ontario	89.3	94.7	88.8	100.0	96.9	98.8	89.8	87.9	79.3	92.6	94.6	90.5
Manitoba	83.0	95.0	81.9	100.0	100.0	84.3	89.2	88.6	85.6	92.7	95.0	90.0
Saskatchewan	79.1	98.7	86.4	92.6	96.6	90.5	84.7	88.2	88.1	92.9	95.5	92.3
Alberta	83.3	96.3	87.0	91.6	92.9	100.0	91.7	92.8	84.1	93.1	95.0	91.3
British Columbia & Territories	91.8	95.0	82.4	85.6	92.0	100.0	89.4	91.2	86.3	92.6	94.6	88.2

Note: Asterisk (*) stands for less reliable data, with a coefficient of variation (CV) between 16 and 33 percent.
Dashes (---) indicate data that cannot be reported because the CV is above 33 percent.

Generally participation rates among males seem to show greater variability than for females over the surveys under review, but otherwise there seem to be few apparent patterns. Overall, the decline in participation rates between the 1990 cohort observed in 1992 and the 1995 cohort

observed in 1997 seems to have been a slightly stronger phenomenon among males than females, and this is certainly true of aboriginals and the activity limited. Participation rates among activity limited males two years after graduation dropped nearly 10 percentage points between 1992 and 1995, while rates for activity limited females dropped just over 1 percentage point.

5.2.2 College Graduates

Participation rates among college graduates who were members of equity groups, shown in Table 4, exhibit similar patterns to those seen among university graduates, with the gender differences in participation rate trends even more pronounced among college graduates. Unlike the aboriginal university graduates however, aboriginal college graduates tend to have participation rates below the overall average, though with the 1997 observation on the 1995 cohort much of the gap was closed.

Table 4 **College Graduate Employment-Equity Group Participation Rates, 1992, 1995 (1990 Cohort) and 1997 (1995 Cohort)**

	Visible Minorities			Aboriginal people			Activity Limited			Total Population		
	1992	*1995*	*1997*	*1992*	*1995*	*1997*	*1992*	*1995*	*1997*	*1992*	*1995*	*1997*
Overall Participation Rate	92.6	94.3	89.5	90.1	89.3	92.0	86.3	82.7	83.6	94.9	94.2	93.4
Overall Enrolment Rate	3.0	0.9	0.1	3.6	0.8	0.0	1.3	9.2	0.0	1.4	0.8	0.1
Gender												
Male	93.6	95.1	87.0	95.3	93.2	89.2	86.3	83.4	79.8	96.5	96.5	91.7
Female	91.7	93.4	92.4	86.6	86.9	95.5	86.3	82.2	87.8	93.6	92.5	95.4
Province / Region												
Atlantic Provinces	91.1	98.1	95.4	90.9	80.5	90.3	83.9	80.4	87.5	95.5	93.8	94.3
Quebec	92.1	94.5	87.2	89.0	97.3	91.6	84.7	92.2	78.4	94.3	94.5	92.3
Ontario	91.5	94.6	89.8	91.8	91.0	92.5	80.6	76.7	80.3	94.6	94.5	93.7
Manitoba	93.3	91.8	97.5	92.8	85.5	92.9	88.1	87.1	93.1	96.1	94.8	96.6
Saskatchewan	88.2	93.9	100.0	85.5	84.2	94.0	90.7	83.1	91.3	95.7	93.9	96.6
Alberta	92.4	92.4	88.3	80.9	94.9	92.7	89.6	90.5	92.3	94.2	94.6	95.2
British Columbia & Territories	94.9	94.2	90.2	96.7	83.5	90.8	93.1	84.0	86.7	95.9	93.4	92.8

Note: Asterisk (*) stands for less reliable data, with a coefficient of variation (CV) between 16 and 33 percent.
Dashes (---) indicate data that cannot be reported because the CV is above 33 percent.

Comparing the two different cohorts in 1992 and 1997 shows a drop in male participation rates of nearly 5 percentage points compared to an increase in female participation rates of nearly two percentages points. The overall trends are mirrored in the equity groups, with male participation rates declining roughly six percentage points between 1992 and 1997, and female participation rates rising one-and-one-half percentage points or more. Precisely what is behind these changes

in labour market participation rates will not be explored in detail in this paper, but general social trends toward delayed family formation and lower birth rates may explain some of the participation rate increases for women.

5.3 Employment Rates

Tables 5 and 6 present employment rates of university and college graduates, for the equity group population as well as the graduate population as a whole. Overall, employment rates were rising over the 1992-1997 period, and the improved economic conditions are evident both among equity groups and graduates as a whole.

5.3.1 University Graduates

A substantial increase in employment for the 1990 university graduate cohort is obvious between two and five years after graduation, with rates rising at least five percentage points over that three-year period. Equity groups experienced similar increases in employment rates as the overall population, with especially strong employment growth among visible minorities. Some of the increase is likely due to generally improving economic conditions, but most appears due to the nature of the early years in the labour market. Comparing the 1990 and 1995 cohorts two years after graduation provides a measure of the impact of improved economic conditions on the employment rates of recent graduates. This comparison shows an increase of less than two percentage points, overall and for each of the equity groups. This suggests that most of the increased employment rates of the 1990 cohort between 1992 and 1995 can be attributed to the cohort's increased experience in the labour market rather than improved economic conditions.

Employment rates of visible minorities rose nearly eight percentage points, from 3.5 percentage points below the overall average to near parity with the overall population. For both the 1990 and 1995 cohorts, however, employment rates two years after graduation are low relative to the total population. Combining these two observations suggests that visible minorities may face greater barriers or instability on entry into the labour market, but this seems to decline as experience in the labour market is gained.

The employment rate of the aboriginals from the 1995 cohort in 1997, in particular male aboriginal university graduates, is either a statistical anomaly or a significant issue. Several

factors seem to suggest that statistical anomaly is the more likely explanation: the employment rate of aboriginal females in 1997 is comparable to the 1992 level; the issue seems to be confined to Ontario among the regions of Canada; and there is no comparable trend among college graduates.

Table 5 University Graduate Employment-Equity Group Employment Rates, 1992, 1995 (1990 Cohort) and 1997 (1995 Cohort)

	Visible Minorities			Aboriginal people			Activity Limited			Total Population		
	1992	*1995*	*1997*	*1992*	*1995*	*1997*	*1992*	*1995*	*1997*	*1992*	*1995*	*1997*
Overall Population Rate	85.9	93.6	86.8	88.6	93.7	77.0	86.1	91.2	87.5	89.4	94.2	91.1
Gender												
Male	85.5	92.9	87.4	86.9	92.6	70.9	87.7	90.6	86.5	89.4	94.1	91.1
Female	86.3	94.4	86.1	89.6	94.3	90.9	84.9	91.5	89.2	89.3	94.3	91.1
Field of Study												
None/Unknown	88.3	83.9	89.5	93.0	100.0	72.9*	78.8	82.9	86.4	87.2	91.9	90.0
Education	88.7	98.7	97.6	87.2	95.1	94.5	91.7	94.1	96.2	92.0	97.0	94.3
Fine Arts & Humanities	78.9	92.9	82.3	91.5	98.5	—	80.7	87.6	81.8	85.9	90.2	87.3
Commerce, Economics & Law	88.3	97.9	83.7	91.4	95.3	70.1*	93.8	87.2	93.1	90.3	95.6	91.2
Other Social Sciences	92.7	92.2	79.8	87.7	89.6	66.2*	79.8	93.6	80.4	87.8	93.8	89.6
Agricultural & Biological Sc.	78.0	88.2	82.3	74.3*	100.0	89.2	55.3*	91.5	72.3	85.4	90.4	85.1
Engineering	84.1	93.3	93.7	68.0*	70.2*	97.7	94.0	92.1	89.8	89.0	94.9	94.1
Medical & Other Health	88.6	94.5	88.5	100.0	90.7	82.0*	99.1	93.1	91.5	95.4	96.7	93.9
Math & Physical Sciences	83.6	91.8	89.5	100.0	100.0	71.5*	87.0	92.9	95.3	89.7	93.8	91.5
Province / Region												
Atlantic Provinces	73.8	84.8	87.3	82.1	91.1	90.8	81.2	86.3	86.1	87.0	91.6	87.9
Quebec	81.9	91.9	88.4	88.0	94.6	100.0	82.0	90.3	89.4	87.1	92.7	91.7
Ontario	85.4	94.5	83.9	89.6	100.0	—	84.2	94.0	87.2	89.7	95.4	90.7
Manitoba	89.3	93.3	90.0	92.7	90.7	87.8	92.6	97.1	94.1	91.9	95.0	92.6
Saskatchewan	90.7	98.0	97.0	81.3	85.6	95.4	89.6	83.8	92.3	92.9	94.9	94.2
Alberta	88.1	95.4	89.1	94.4	87.6	92.2	93.9	91.9	85.6	91.3	95.3	92.6
British Columbia & Territories	91.7	93.1	89.1	93.0	92.0	94.5	88.9	87.3	85.5	91.4	93.8	90.6

Note: Asterisk (*) stands for less reliable data, with a coefficient of variation (CV) between 16 and 33 percent.
Dashes (—) indicate data that cannot be reported because the CV is above 33 percent.

Employment rates of university graduates who are activity limited are a relatively steady three percentage points below the overall average in each of the surveys under review. While employment rates over gender, fields of study, and province or region vary from one survey to the next, few stable patterns are evident. Among the provinces, Manitoba stands out as having particularly high employment rates among the activity limited. Again, small sample sizes forces caution on any conclusion, but the finding raises interesting questions of whether policies or attitudes vary from province to province and have a measurable impact on employment rates.

5.3.2 College Graduates

Overall, employment rates of college graduates fall roughly three percentage points below their university graduate counterparts in the two panels of the NGS under review here. Among equity groups, however, employment rates of college graduates are roughly five percentage points or more below their university counterparts. This notable difference between university and college graduates who are members of equity groups is evident among both males and females. This suggests that equity groups who graduate from colleges face relatively greater barriers to employment than university graduates. Whether these barriers include systematic discrimination is still an open question.

Table 6 **College Graduate Employment-Equity Group Employment Rates, 1992, 1995 (1990 Cohort) and 1997 (1995 Cohort)**

	Visible Minorities			Aboriginal people			Activity Limited			Total Population		
	1992	1995	1997	1992	1995	1997	1992	1995	1997	1992	1995	1997
Overall Population Rate	82.7	88.2	81.9	76.4	84.8	83.3	81.4	84.3	79.5	86.0	90.7	88.1
Gender												
Male	79.7	89.7	83.4	70.0	78.8	81.4	76.9	84.7	81.3	83.9	89.9	87.6
Female	85.6	86.6	80.4	81.2	88.8	85.6	85.4	84.1	77.7	87.8	91.3	88.5
Field of Study												
Arts & Humanities	81.2	86.5	83.3	76.6	82.0	79.9	80.9	81.3	72.3	82.6	87.8	86.6
Health Sciences	97.5	92.8	92.5	98.6	96.0	95.1	91.3	94.6	84.3	96.0	96.8	92.8
Other Engineering Technology	77.3	89.2	93.9	64.0*	100.0	82.6	72.7	83.5	84.2	84.4	92.0	90.3
Electronics, Math & Comp. Sc.	77.7	90.6	82.3	77.0*	100.0	86.6	80.2	97.4	79.7	87.8	93.8	88.8
Mech. & Structural Eng. Tech.	79.3	78.6	82.3	57.6*	82.9	74.9	65.0	88.0	86.5	79.0	91.4	86.8
Natural Sciences & Primary Ind.	81.1	81.5	96.1	61.9*	77.1*	77.0	77.9	91.9	79.5	84.9	91.1	89.1
Social Sciences & Services	87.3	92.3	79.8	80.8	94.8	92.2	89.7	90.3	84.4	89.9	94.3	91.8
Secretarial Sciences & Merch.	81.5	91.2	72.1	76.2	81.2*	75.8	80.8	88.6	76.8	86.0	91.4	81.2
Management & Administration	82.0	89.8	76.5	76.4	80.1	78.1	79.2	82.8	71.5	89.0	93.0	86.1
Province / Region												
Atlantic Provinces	83.2	81.2	82.4	67.6	81.7	77.1	74.2	80.7	76.9	77.5	82.1	82.2
Quebec	79.4	80.1	66.1	69.6	80.5	85.2	85.3	80.3	79.2	86.0	89.0	85.9
Ontario	80.6	88.3	84.5	81.0	89.1	86.2	79.3	82.2	74.2	87.1	92.4	88.8
Manitoba	85.3	94.9	93.3	69.4	80.5	85.9	80.0	87.4	88.4	87.4	92.2	94.3
Saskatchewan	100.0	100.0	88.4	64.5	79.1	87.6	77.5	84.5	89.8	87.8	92.0	94.4
Alberta	84.2	85.0	88.6	79.8	84.4	84.4	89.5	88.5	90.7	89.0	92.7	93.9
British Columbia & Territories	86.3	91.2	87.2	80.5	85.2	78.8	80.8	87.0	80.5	86.1	92.3	89.5

Note: Asterisk (*) stands for less reliable data, with a coefficient of variation (CV) between 16 and 33 percent.
Dashes (—) indicate data that cannot be reported because the CV is above 33 percent.

Among visible minorities, college graduates show the same sharp rise in employment rates between the second and fifth year after graduation as seen among university graduates, though

the effect is largely limited to male visible minorities. Comparing across the 1990 and 1995 college graduate cohorts, shows that the 1995 cohort of visible minority college graduates had slightly lower employment rates while overall employment rates were rising.

Among aboriginals, employment rates among females are consistently higher than males, and the differences are particularly large for the 1990 cohort in 1992 and 1995. Comparing the two cohorts two years after graduation show the 1995 cohort enjoying employment rates in 1997 seven percentage points above their counterparts in the 1990 cohort.

For the activity limited, employment rates for the 1990 cohort moved upward with the overall average between 1992 and 1995, but employment rates two years after graduation fell for the 1995 cohort relative to the 1990 cohort.

Overall, college graduates who are members of equity groups have substantially lower employment rates than the overall population, generally five percentage points lower. This finding suggests that young members of equity groups face significantly higher barriers to employment than their peers in the rest of the college population. Among visible minorities and aboriginals, there is some sign that these barriers erode with experience, as indicated by a relatively large increase in the employment rate between two and five years after graduation. Among the activity limited, however, employment rates rose between 2 and 5 years after graduation, but not as fast as in the population as a whole.

5.4 Summary on Participation and Employment

This review of the raw employment rate figures for the equity groups and the overall graduate population suggests that there are somewhat greater barriers to labour market attachment for equity groups than for the rest of the population.

Participation rates among equity groups are generally somewhat below those of the rest of the population, with a larger gap among the activity limited and college graduates in all three equity groups. The major exception is aboriginal university graduates who have higher than average participation rates.

Employment rates for all equity groups are uniformly below the overall average in all three years of observations, among both university and college graduates. Among college graduates, employment rates among equity groups are at least 2.5 percentage points below the overall average. This also means, of course, that unemployment rates among equity groups who are college graduates are at least 2.5 percentage points higher than the overall average.

5.5 Potential Sources of Differences in Participation and Employment Rates

Wannell and Caron (1994a) discuss a number of possible reasons other than discrimination for lower participation rates among equity groups using the 1992 data on the 1990 cohort of graduates. They consider and reject each of the following hypotheses.

- Visible minorities are more likely to be visa students and thus face legal and language barriers to the Canadian labour market. However visa students, as a group, have employment rates similar to non-visa students and the employment gap for visible minorities exists for both visa and non-visa students. Language difficulties are not likely to be a significant barrier since ability to complete a course of study in a Canadian educational institution would require a degree of mastery of English or French. Further those with mother tongues other than English or French, who are not visible minorities, tend to have very high employment rates.

- Aboriginal people may live in areas with high unemployment rates, so their lower employment and participation rates could reflect local labour market conditions. The NGS has no local labour market indicators smaller than the province so this hypothesis is difficult to test. Aboriginal graduates of universities, who tend to locate in larger centres, have similar employment rates to other graduates.

- The activity limited with more severe limitations may be less employable or have employment spells interrupted more frequently that those with less severe limitations, and this may account for much of the difference in employment and participation rates relative to the rest of the population. Wannell and Caron (1994a) construct an index based on the number of activity limitations cited by respondents. They find that the participation rate tended to fall as the number of limitations rose, but the unemployment rate was not sensitive

to the index. They conclude that "severity of limitation appears to have an impact on the participation rate, but the merely the presence of any limitation triggers an increase in the unemployment rates." (p. 50.)

Though no conclusions should be drawn without controlling for known factors contributing to success in the labour market, these raw figures indicate differences that warrant further exploration using more sophisticated statistical techniques. We leave that exercise for further research and focus our attention on an exploration of earnings comparisons between equity groups and the rest of the population. In this paper, we note that differences in participation and employment rates could introduce bias into the earnings regressions, and so we adopt regression models designed to overcome any bias in earnings estimates related to barriers to labour market success faced by members of equity groups.

6. Earnings Comparisons

What do the raw data indicate about differences in earnings between members of equity groups and the population overall? The earnings ratio expresses the average annual earnings of the designated group as a percentage of the average annual earnings of all graduates. A ratio of 100 indicates earnings parity between the two groups. If the designated group earns less, the ratio will be less than 100; if more, greater than 100. The data underlying these calculations are average annual earnings as reported in the surveys, with no adjustments made for hours or weeks worked, or any other factors generally associated with differing pay rates. Because none of these factors are taken into account, we make no conclusions here about whether earnings differentials are different from zero in a statistically significant fashion, noting instead cases where the raw differences and changes over time appear to be large.

6.1 University Graduates

Table 7 shows average earnings level of equity group members expressed as a percentage of average earnings of all other university graduates overall and by degree level. Overall the most notable feature of the table is the extent to which the average earnings of equity groups two years after graduation have declined relative to the rest of the graduate population, particularly for visible minorities and the activity limited. At this point we only flag this observation, and the multivariate analysis in the following section will analyze the extent to which these declines can be attributed to measured factors.

Members of visible minorities in the 1990 graduate cohort earned slightly more than other university graduates in 1992 and 1995, though 1997 data on 1995 graduates shows a sharp decline in relative earnings among visible minorities compared to their counterparts in the 1990 cohort. This decline relative to the peer average is especially strong at the bachelors level, with a 14 percent decline between the 1990 and 1995 cohorts, both measured two years after graduation. Relative declines are also evident at the Masters level, though the opposite is true for the comparatively small group at the Doctorate level.

Overall, earnings for aboriginal graduates are only slightly below their peers. Average earnings for 1990 aboriginal graduates of universities in 1992 were virtually identical to the average of all other graduates, though there is some evidence of deterioration in the five-year follow-up survey.

The data on relative earnings levels of Aboriginal graduates by degree attainment for 1992 show average earnings at each degree level as being greater than the average of all graduates. For all three years, earnings of Aboriginal graduates at advanced degree levels are higher than those of other graduates, but in 1995 and 1997, their earnings are slightly less for those with a Bachelor's degree, resulting, because of the relatively large numbers at the Bachelor's level, in a ratio overall that is slightly below 1.0. At higher degree levels, there is some indication that returns to post-graduate education are high for aboriginals relative to the rest of the graduate population, but small sample sizes and not accounting for other factors discourages drawing strong conclusions.

Table 7 **University Graduate Employment-Equity Group Earnings Ratios, 1992, 1995 (1990 Cohort) and 1997 (1995 Cohort)**
Expressed as a Proportion of Earnings of All University Graduates

	Visible Minorities			Aboriginal people			Activity Limited		
	1992	*1995*	*1997*	*1992*	*1995*	*1997*	*1992*	*1995*	*1997*
Total Population	102.5	101.2	91.7	101.2	95.6	96.9	93.9	95.1	84.5
Degree Level									
Bachelors / 1st Professional Degree	103.8	101.7	89.8	103.4	97.3	99.9	94.6	96.0	83.7
Masters	92.9	96.1	84.7	112.6	106.6	108.0*	89.9	88.9	83.9
Doctorate	91.0	94.9	95.9	125.1*	103.7	127.8	109.1	93.1	88.4

Note: Asterisk (*) stands for less reliable data, with a coefficient of variation (CV) between 16 and 33 percent.
Dashes (---) indicate data that cannot be reported because the CV is above 33 percent.

Average earnings among the activity limited are somewhat below the average of their peers for the 1990 cohort, though a small degree of catch-up is evident between two and five years after graduation. Comparing the 1995 cohort with the 1990 cohort two years after graduation reveals a substantial decline in relative earnings for the activity limited. Whether this relative decline, as well as that observed among visible minorities, can be explained by measured factors through multivariate analysis will be explored in the next section.

6.2 College Graduates

Table 8 presents average earnings ratios for equity groups among their college graduate peers. As was the case with university students, the most striking observation to be made here is the sharp declines in the relative earnings of minority groups within the 1995 cohort two years after graduation compared to the 1990 cohort two years out. The major difference is that while aboriginal university graduates did not exhibit the very large declines seen among visible minorities and the activity limited, declines in the relative earnings of aboriginal college graduates are similar to those seen among college graduates who are in the visible minorities or activity limited populations. Declines in relative earnings range from 8 percentage points among aboriginals to 10 points among visible minorities and 17 percentage points among the activity limited. Similar patterns are evident when the sample is split into those earning trade certificates and diplomas and those earning college certificates and diplomas.

Table 8 **College Graduate Employment-Equity Group Earnings Ratios, 1992, 1995 (1990 Cohort) and 1997 (1995 Cohort)**
Expressed as a Proportion of Earnings of All College Graduates

	Visible Minorities			Aboriginal people			Activity Limited		
	1992	*1995*	*1997*	*1992*	*1995*	*1997*	*1992*	*1995*	*1997*
Total Population	97.7	101.0	88.3	97.2	89.9	89.3	97.5	92.6	81.0
Degree Level									
Trade Certificate / Diploma	96.7	98.0	80.8	94.0	88.8	89.8	94.6	93.0	81.9
College Certificate / Diploma	99.1	104.4	92.6	105.1	93.2	88.8	102.6	94.1	80.6

Note: Asterisk (*) stands for less reliable data, with a coefficient of variation (CV) between 16 and 33 percent.
Dashes (—) indicate data that cannot be reported because the CV is above 33 percent.

The 1992 observations on the 1990 cohort showed remarkable parity in average equity group earnings relative to the rest of the population, though equity groups seemed to do relatively better with college training than trades training. The 1995 follow-up showed that earnings of visible minorities were increasing relative to the average, while those of aboriginals and the activity limited declined.

7. Earnings Regression Results

Individual earnings are affected by a number of individual and labour market factors, many of which, but not all, are measured by variables in the National Graduates Surveys. Multivariate models are used to isolate the influence that each such factor has on the earnings of individuals within each group, independent of the influence of the other factors. Other characteristics thought to be important in labour market success such as communication or teamwork skills, attitude and dedication, and more general differences in ability that may be partially captured by grade point average, for example, are not observed. Lack of these variables poses some problems in interpreting the results, if they are correlated in some way with equity groups, since these could explain some differences in earnings on a productivity basis. Unobserved variables pose a particular problem in seeking evidence of earnings discrimination because employer prejudice or bias on the basis or skin colour, ethnic origin, or activity limitations also cannot be directly observed. As a result, the estimates of earnings differentials associated with minority groups include any portion of the unobserved characteristics correlated with equity group status as well as earnings discrimination associated with equity group status.

With the limitation associated with unobserved characteristics in mind, a special construction of a multivariate model can be used to test the hypothesis that equity groups are treated differently in the labour market. We examine several such constructs to test whether the different sets of assumptions embodied in the various models yield consistent conclusions about discrimination. In general, these models cannot prove that there is earnings discrimination against equity groups in the Canadian labour market. But they can provide evidence of the *possibility* of discrimination, if differences in earnings are seen to be statistically significantly different from zero.

A common set of explanatory variables was employed for the various methods. The set includes, in addition to the dummy variable for equity group status, age, gender, degree level attained, field of study, region, an indicator of previous full time employment greater than three years prior to registration, average hours worked, public sector employment, two indicators of provincial migration of students during and after graduation, married status and an indicator of the presence of children. Note that the NGS data provide a limited set of controls for characteristics that

could have an impact on earnings. In particular, characteristics commonly cited by employers as desirable including communication skills, team skills, dedication, perseverance, and a desire to learn are not well measured. Similarly, earnings may be related to the reputation of the college or university attended, or the class standing or grade point average of the graduate, or some other indication of the actual or potential productivity of the graduate. If any of these unobserved factors are correlated with equity group status, a bias will be introduced into estimates of the earnings differentials between equity groups and the rest of the population. For this reason we are cautious about attributing the underlying cause of statistically significant differences in earning of equity groups to labour market discrimination.

7.1 Ordinary Least Squares with Dummy Variables

Table 9 presents Ordinary Least Squares (OLS) estimates of the coefficients on the dummy variables associated with equity groups from a regression equation on the natural logarithm of annual earnings. Each cell in the table is drawn from a separate regression including a dummy variable with a value of 1 if the individual is a member of the indicated equity group and 0 otherwise.

Separate regressions were run for each equity group within both the university and college populations. For simplicity we do not report the full results of the regressions here, choosing to focus on the estimated earnings differences associated with equity group status.[21]

Table 9 **Simple Ordinary Least-Squares Regression Coefficients on Dummy Variables for Employment-Equity Groups, 1992, 1995 (1990 Cohort) and 1997 (1995 Cohort)**

	Visible Minorities			Aboriginal people			Activity Limited		
	1992	*1995*	*1997*	*1992*	*1995*	*1997*	*1992*	*1995*	*1997*
University Graduates	-0.016	-0.024	-0.029	-0.053	0.017	-0.013	-0.054	-0.021	-0.087*
College Graduates	-0.032*	-0.044*	-0.078*	-0.023	-0.100*	-0.068*	-0.055*	-0.064*	-0.092*

Note: Asterisk (*) indicates statistical significance at .05 level.

Since the dependent variable in each regression is log earnings, the coefficients on the equity group dummy variable may be interpreted as the percentage difference in earnings associated

[21] The reader is reminded that with the dummy variable approach, the coefficient estimates on all the other explanatory variables are in effect constrained to be equal for all the sub-populations included in the regression.

with each equity group relative to the rest of the graduate cohort. For example, the earnings equation for university graduates in 1992 indicates that, controlling for other factors, being a member of a visible minority group was associated with 1.6 percent lower earnings than the overall average. Average earnings of members of equity groups who hold university degrees tend to be lower than their peers, after controlling for other observed factors that could affect productivity. Only in the case of the activity limited in 1997, with an estimate of 8.7 percent lower earnings, is the result statistically significantly different from zero at the .05 confidence level.

Results on college graduates indicate that equity group earnings generally support the possibility of discrimination more than the results for university graduates. Coefficients estimates on the equity group dummy variables are uniformly estimated to be negative, and significantly different from zero in eight of nine instances. For both visible minorities and the activity limited populations, the estimates are significantly significant at all three points in time. Controlling for other factors, visible minorities from the 1990 graduate cohort earned 3.2 percent less than their peers in 1992, and the gap rises to 4.4 percent in 1995, after three more years in the labour market. With the 1995 graduate cohort, visible minority status was associated with 7.8 percent lower earnings than their college graduate peers, controlling for other factors.

Aboriginal college graduates from the class of 1990 had a 10.0 percent deficit in earnings compared to their peers in 1995, rising from a 2.3 percent deficit which could not be distinguished from a zero difference in 1992. The estimated earnings differential among aboriginals relative to their 1995 college graduate peers in 1997 was 6.8 percent, and is statistically different from zero at a 0.05 confidence level.

Among those in the 1990 graduating class, activity limited college graduates earned 5.5 percent less than their peers in 1992, with the gap rising to 6.4 percent in 1995. With the 1995 cohort, those identified as activity limited earned 9.2 percent less in 1997 than others with otherwise similar observed characteristics.

In summary, among college graduates there appears to be a sizeable and statistically significant difference in earnings between equity groups and the rest of the population. In all cases, the

differential rose with experience in the labour market, and across cohorts over time as measured two years after graduation.

These OLS estimates do not take into account possible bias resulting from the fact that we cannot observe the earnings of the unemployed and of those not participating in the labour market. While the Heckman model in the next section tests for and adjusts for this potential bias, the simple OLS results do not allow us to reject the possibility of earnings discrimination associated with equity groups.

7.2 The Jackson-Lindley Approach

The Jackson-Lindley model relaxes the constraint of the OLS Dummy Variable model that the coefficients associated with other earnings-related characteristics must be equal for the equity group and the remaining population. By using interaction terms for all the earnings equation regressors, this approach divides the difference between two groups' average earnings into two components. The first is referred to as the explained or characteristics component. It captures the difference in earnings due to the differences in the earnings-related characteristics of each group. For example, if one group has more graduates with advanced degrees or who graduated from high-earnings fields of study, they are expected to earn more and this difference is captured by the characteristics component. The second component, the coefficient or residual component, picks up differences in the way in which the characteristics of each group are rewarded. If a group is treated significantly worse for a number of different characteristics, the evidence of differential treatment gets stronger.

In the interpretation of the model, a certain number of conditions must be met to provide compelling evidence of labour market discrimination. A model that includes the possibility of differential rewards for a designated group is better at explaining average earnings than a similar model that doesn't isolate the designated group. (An F-test for adding a designated group dummy variable and a full set of interaction terms is significant at the 0.05 level.)

- The overall effect of the differential rewards for the designated group – the coefficient component – is negative.

- Net of all the other characteristics, there should be a negative effect associated with being a member of the designated group.

- There should be some evidence of characteristics that are rewarded differently for which the most obvious explanation is discrimination. (There should be negatively signed interaction terms that aren't easily attributable to other models of labour market behaviour.)

Readers are cautioned that recent literature points out that both the size and significance of the coefficients on dummy variables, including the dummy for the designated groups, vary with the choice of reference groups for any dummy variables included in the regression. For this reason, the magnitudes of these coefficient defy interpretation, and we focus on the sign of the coefficient as a signal of possible of labour market discrimination.

Each of these points is addressed in the following summary tables where an asterisk is placed beside a value that is statistically significant at 0.05 level. The inter-group earnings differential is expressed as the difference in the log of earnings for each group which indicates the percentage difference between the groups. In the first table, for example, the log earnings of visible minorities minus the log earnings of others equals 0.0348 for 1992: visible minorities earn about 3.5 percent less than other university graduates.

The coefficient component indicates the net effect of differential treatment in the labour market. For example, as indicated in Table 10, visible minorities earn 1.7 percent less than others due to differences in the way the labour market rewards their characteristics compared to the rest of the population. The "designated group intercept" captures differences in earnings not captured by other factors, that is, unexplained differences in earnings which could also be associated with discrimination. Finally, we list all variables for which the treatment was significantly different for the designated group, indicating whether the difference was positive or negative.

The model includes information on age, marital status, children, parents' education, home language, previous work experience, field of study, level of degree or length of program, public sector employment, region of residence and hours of work.

Table 10 **Visible Minorities Earnings Model, University and College Graduates, 1992, 1995 (1990 Cohort) and 1997 (1995 Cohort)**

University Graduates	**1992**	**1995**	**1997**
Difference between designated group and all others:	0.005	0.003	0.002
• Due to characteristics	0.022	0.028	0.030
• Due to coefficients	-0.017*	-0.025*	-0.028*
Coefficient of Designated Group Intercept	0.483*	0.396	1.074*
F-test for adding designated group variables	3.90*	2.03*	3.93*
Lower Designated Group Rewards	Atlantic	Changed Province For School; Still Working There	Agriculture & Biological Sciences
	Quebec	Quebec	Commerce, Economics and Law
	Public Service	Atlantic	Fine Arts & Humanities
Higher Designated Group Rewards	Education Faculty	Education Faculty	One Parent Has Post-Sec. Degree
	Pre-Graduation Experience > 3 Years	Fine Arts & Humanities	Changed Province For School; Still Working There
	Fine Arts and Humanities	Pre-Graduation Experience > 3 Years	Education Faculty
College Graduates			
Difference between designated group and all others:	-0.009*	-0.004*	-0.033*
• Due to characteristics	0.024*	0.041*	0.046*
• Due to coefficients	-0.033*	-0.044*	-0.079*
Coefficient of Designated Group Intercept	-0.369	-0.111	0.446
F-test for adding designated group variables	1.99*	2.13*	3.08*
Lower Designated Group Rewards	Mechanical & Structural Engineering	Quebec	Social Sciences & Services
	Prairies	Atlantic	Other Engineering Technology
	B.C. & Territories	Mechanical & Structural Engineering	Natural Sciences & Primary Industry
Higher Designated Group Rewards	Natural Sciences & Primary Industry	Natural Sciences & Primary Industry	One Parent Has Post-Sec. Degree
	One Parent Has a Post-Sec. Degree	Atlantic	Married
	Women	Social Sciences & Services	Quebec

Note: Asterisk (*) indicates significance at .05 level for the coefficients.

The earnings differentials will be somewhat different from the previous section, since a slightly more restrictive population is used[22] and observations with missing values for any variable in the model have to be dropped.

22 The population is further limited to those who were employed full-time in January and October of 1991 to control for work experience since graduation.

7.2.1 Visible Minorities

For visible minorities, the results from the Jackson Lindley approach consistently indicate that, despite greater endowments of characteristics typically associated with higher compensation, these characteristics are compensated at lower rates among visible minorities than among other university and college graduates. Relatively small raw earnings differentials seem to mask the fact that higher levels of desirable labour market characteristics among visible minorities are compensated at rates lower than the rest of the population.

Raw earnings differentials between visible minorities and all other university graduates amounted to a 0.5 percent premium for visible minorities over the rest of the population in 1992, and a 0.3 percent premium 1995, and a 0.2 percent premium in 1997.

The coefficient of the designated group intercept, the remaining difference in earnings between members of visible minorities and all others after differences in characteristics and how characteristics are rewarded are netted out, results in a statistically significant premium of 48 percent in 1992. Similarly, there is a premium associated with the designated group intercept for all years of observation, casting doubt on the conclusion that visible minorities are subject to systematic discrimination in earnings.

Among college graduates of 1990 we find raw earnings differentials of 0.9 percent less in 1992 and 0.4 percent less in 1995, and 3.3 percent less in 1997 among visible minority students compared to non-visible minorities. In all three years of observations on college students, differences due to characteristics are positive, ranging from 2.4 to 4.6 percent, indicating a relatively greater endowment of desirable labour market characteristics among college-educated visible minorities.

We conclude that there is some evidence of potential earnings discrimination against visible minorities at both college and university levels. The evidence, however, is not overwhelming.

7.2.2 Aboriginal people

Table 11 shows the results of the Jackson-Lindley model for aboriginal graduates included in the National Graduates Surveys. Among aboriginal university graduates of 1990 we find raw

earnings differentials of 1.5 percent less in 1992, and 3.6 percent less in 1995, and 4.9 percent less in 1997, compared to non-aboriginals university graduates.

Table 11 **Aboriginal People Earnings Model, University and College Graduates, 1992, 1995 (1990 Cohort) and 1997 (1995 Cohort)**

University Graduates	1992	1995	1997
Difference between designated group and all others:	-0.015*	-0.036*	-0.049*
• Due to characteristics	0.038*	-0.053*	-0.037*
• Due to coefficients	-0.053*	0.017*	-0.012*
Coefficient of Designated Group Intercept	-2.056*	-0.091	0.182
F-test for adding designated group variables	1.99*	1.82*	3.23*
Lower Designated Group Rewards	Pre-Graduation Experience > 3 Years	Fine Arts & Humanities	Engineering
	B.C. & Territories	Has a Child	Math & Physical Sciences
	Has a Child	Math & Physical Sciences	Medicine & Other Health
Higher Designated Group Rewards	One Parent Has Post-Sec. Degree	One Parent Has Post-Sec. Degree	Public Sector
	Math & Physical Sciences	Married	Women
	Agriculture & Biological Sciences	Women	Has a Child
College Graduates			
Difference between designated group and all others:	-0.030*	-0.099*	0.025*
• Due to characteristics	-0.007*	0.002*	0.093*
• Due to coefficients	-0.023*	-0.101*	-0.068*
Coefficient of Designated Group Intercept	-0.428	0.563	0.613
F-test for adding designated group variables	1.02	2.94*	1.97*
Lower Designated Group Rewards	Changed Province For School; Still Working There	Age	Atlantic
	Atlantic	Has a Child	Prairies
	Electrical & Electronic Engineering	Electrical & Electronic Engineering	B.C. & Territories
Higher Designated Group Rewards	Natural Sciences & Primary Industry	Changed Province For School; Still Working There	Natural Sciences & Primary Industry
	Mechanical & Structural Engineering	Other Engineering Technology	One Parent Has a Post-Sec. Degree
	Social Sciences & Services	Secretarial Sciences & Merchandising	Has a Child

Note: Asterisk (*) indicates significance at .05 level for the coefficients.

The only consistent and statistically significant indication of discrimination is for university graduates in 1992; but the coefficient on the designated group intercept is so large that the standard interpretation of the coefficient makes no sense.

Among college graduates, aboriginal wages are lower than their counterparts in 1992 and 1995 but 2.5 percent above the rest of the population in 1997. Much of the difference seems to be due to differences in how characteristics are rewarded between the two groups. In all three observation years the differential valuation of characteristics results in a penalty ranging from -0.7 to 9.3 percent. The designated group intercept, however, is never statistically significant and carries the "wrong sign" for evidence of discrimination.

We conclude that while there is some evidence of the possibility of discrimination in the case of aboriginals, the evidence is inconclusive, since in only one case, university graduates in 1992, is there a consistent and statistically significant pattern of discriminatory earnings differentials.[23]

7.2.3 Activity Limited

Table 12 summarizes the results of the Jackson-Lindley approach for assessing earnings differentials between the activity limited and the rest of the college and university graduate population. Among 1990 university graduates, those who were activity limited had 5.4 percent lower earnings in 1992, though three years later, the differential had shrunk to 2.7 percent. With the 1995 cohort of graduates, the differential two years after graduation was 7.6 percent.

Most of this earnings differences appear to be due to variations in the way characteristics are rewarded, and little or none due to differentials in endowments of characteristics compared to the rest of the university graduate population. In 1992, observed differences in characteristics explain none of the earnings differential, and all of the differences in earnings are attributed to differential rewards for those characteristics. By 1995, the gap in earnings is cut in half, due in large part to shrinking differences in rewards associated with characteristics, that is, the differences due to coefficients.

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[23] The lack of significant results may be due to the relatively small numbers of observations available for aboriginal people–about one-third the number available, e.g., for members of visible minorities and a lower ratio still for university graduates.

Table 12 **Activity Limited Earnings Model, University and College Graduates, 1992, 1995 (1990 Cohort) and 1997 (1995 Cohort)**

University Graduates	**1992**	**1995**	**1997**
Difference between designated group and all others:	-0.054*	-0.027*	-0.076*
• Due to characteristics	-0.000*	-0.006*	0.012*
• Due to coefficients	-0.054*	-0.021*	-0.089*
Coefficient of Designated Group Intercept	-0.158	0.023	0.002
F-test for adding designated group variables	1.06	1.62*	2.52*
Lower Designated Group Rewards	Other Social Sciences	Prairies	One Parent Has Post-Sec. Degree
	Education Faculty	One Parent Has Post-Sec. Degree	Married
	Fine Arts and Humanities	B.C. &Territories	Medicine & Other Health
Higher Designated Group Rewards	Prairies	Engineering	Engineering
	Married	Other Social Sciences	Math & Physical Sciences
	Atlantic	Medicine & Other Health	Public Sector
College Graduates			
Difference between designated group and all others:	-0.031*	-0.072*	-0.022*
• Due to characteristics	0.024*	-0.008*	0.069*
• Due to coefficients	-0.055*	-0.064*	-0.092*
Coefficient of Designated Group Intercept	0.416	-0.335	0.999*
F-test for adding designated group variables	1.09	1.37	1.59*
Lower Designated Group Rewards	Quebec	Atlantic	Health Sciences
	Other Engineering Technology	Natural Sciences & Primary Industry	Electrical & Electronic Engineering
	Women	Mechanical & Structural Engineering	Age
Higher Designated Group Rewards	Health Sciences	Changed Province For School; Still Working There	Natural Sciences & Primary Industry
	Management & Administration	Health Sciences	Has a Child
	Changed Province For School; Still Working There	One Parent Has a Post-Sec. Degree	Changed Province For School; Still Working There

Note: Asterisk (*) indicates significance at .05 level for the coefficients.

The 1997 observations on the 1995 cohort of university graduates presents a somewhat different picture. The 7.6 percent raw earnings gap between the activity limited and the all other university graduates of 1995, was more than two percentage points larger than that seen in the 1992 observation on the 1990 cohort. The earnings gap in 1997 was larger despite the fact that the activity limited had greater endowments of characteristics associated with higher earnings in

the labour market. Differences in the way these characteristics between the activity limited and the rest of the population explained 8.9 percentage points.

Much of the differential seems to be associated with how the market values the earnings related characteristics of the activity limited at lower levels than the rest of the population. While these estimates are statistically significant at the 0.05 level, the designated group intercept has the wrong sign in 1995 and 1997 and the term is never statistically significant. There is, therefore, no overwhelming evidence of earnings discrimination against the activity limited, though the possibility cannot not be completely discounted.

Among 1990 college graduates, the activity limited had roughly 3 percent lower earnings in 1992 and 7.2 percent in 1995, and the 1995 cohort had 2.2 percent lower earnings in 1997 relative to the rest of college graduates. As with university graduates, most of this difference appears to be due to variations in the way characteristics were rewarded, as the activity limited had similar or greater endowments or observed characteristics relative to the rest of the college population. After accounting for observed differences, the earnings deficit grew to 5.5 percent for the activity limited compared to the rest of the university graduate population in 1992, and this grew 6.4 percent by 1995.

With the 1997 observation of the 1995 cohort, the activity limited had a smaller overall earnings gap, but a greater gap in the way observed characteristics were rewarded, compared to the 1992 observation of the 1990 cohort. Endowments of observed characteristics of the activity limited in 1997 might have generated a 6.9 percent earnings premium relative to the rest of college graduates, but apparent differences in the way these characteristic were rewarded among the activity limited more than outweighed the effect of the greater endowments.

Thus in all three observation years of the activity limited among both university and college graduate, we find that observed characteristics are rewarded at lower rates for the activity limited, ranging from 2.1 to 9.2 percent of average earnings. While the differences in coefficients all point to the possibility of discrimination, the criterion of a negative and statistically significant designated group intercept is never. Further, none of the characteristics associated with higher or lower rewards among the designated groups seem obviously associated with the activity limited, though this may reveal more about the limited set of characteristics available in the NGS data

than the true nature of the earnings differential. Thus, on a strict application of the established criteria for the possibility of discrimination under the Jackson-Lindley procedure, we cannot conclude that the earnings differentials between the activity limited and the rest of the graduate population are due to discrimination.

7.2.4 Summary of Jackson-Lindley Results

In none of the 18 equity group populations could we unreservedly declare that there was evidence of earnings discrimination. In two cases, Aboriginal university graduates in 1992, and Activity Limited college graduates in 1997, three of the criteria for discrimination were met. The designated group intercept, although statistically significant in these two cases, was so large as to defy interpretation, and there is a possibility that small sample sizes confound the analysis.

7.3 Heckman Model Approach

We use the Heckman model to determine whether there is sample selectivity bias in either or both the equity group population and the non-equity group population associated with non-randomly missing earnings data. As discussed above, the model requires a two stage procedure with a probit equation on whether or not earnings above $5000 are observed. From this regression we retain the calculated Inverse Mills Ratio values and employ them as a regressor variable in the second stage equation – an earnings equation using maximum likelihood estimation procedures. Thus the Heckman procedure both tests and corrects for bias in the earnings estimates, for both the equity group and residual populations. Only if there are substantial differences in selection patterns between equity groups and the rest of the population will the Heckman procedure result in estimates of earnings differentials between equity groups and the rest of the population that are markedly different from the simple OLS approach.[24]

Generally, we find that correcting for selection bias using the Heckman model leads to similar conclusions as those reached under the OLS estimates for college graduates, and reverses the conclusions for university graduates.

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[24] Note that our use of this procedure does not deal directly with the issue of attrition between survey years. We use the Heckman procedure to determine whether, within a particular sample year, the fact that the *earnings* of some persons in the sample are unobserved leads to a bias in the estimation of all of the coefficients in the earnings equation. It would be possible to use a similar procedure to test for bias in the 1995 earnings due to non-random attrition in the sample, based on information from the 1992 sample, but we leave this analysis for future research.

Separate regression equations were run for each of the three equity group populations and the relevant remaining populations, and for three years of observation, 1992, 1995 and 1997, for both university and college populations – 36 different sample groups in all.[25]

Table 13 presents a summary of the relevant results from these regressions. Generally, these results indicate the possibility of labour market discrimination against equity groups.[26]

Table 13 **Heckman Specification – 1992 and 1995 (1990 Cohort) and 1997 (1995 Cohort)**

	Visible Minorities			Aboriginal People			Activity Limited		
	1992	*1995*	*1997*	*1992*	*1995*	*1997*	*1992*	*1995*	*1997*
University Graduates									
Difference between designated group and all others (Stage 2)	0.005	0.003	0.002	-0.015	-0.040	-0.044	-0.054	-0.027	-0.076
• Due to characteristics	0.019	0.020	0.017	0.052	-0.043	-0.033	0.016	0.0030	0.023
• Due to coefficients	-0.014	-0.016	-0.015	-0.067	0.005	-0.011	-0.070	-0.030	-0.100
Difference in Selection (Stage 2)	0.053	0.024	0.020	-0.040	-0.093	-0.140	-0.070	-0.020	-0.015
• Due to characteristics (Mean Mills Ratio difference)	0.012	0.007	-0.000	-0.008	-0.012	0.000	-0.001	-0.003	0.000
• Due to coefficients (Difference in coefficient on Mills)	0.041	0.017	0.020	-0.032	-0.082	-0.140	-0.069	-0.017	-0.015
College Graduates									
Difference between designated group and all others (Stage 2)	-0.007	-0.003	-0.033	-0.030	-0.096	0.024	-0.031	-0.073	-0.023
• Due to characteristics	0.011	0.001	0.009	0.015	-0.002	0.070	0.034	-0.013	0.055
• Due to coefficients	-0.018	-0.004	-0.042	-0.045	-0.094	-0.045	-0.065	-0.059	-0.078
Difference in Selection (Stage 2)	0.053	0.004	-0.047	0.043	-0.117	-0.064	-0.036	-0.033	-0.057
• Due to characteristics	0.015	0.005	0.010	0.014	-0.011	-0.001	0.006	-0.004	0.001
• Due to coefficients	0.038	-0.001	-0.056	0.029	-0.106	-0.063	-0.041	-0.029	-0.058

The table breaks down the measured differences in earnings into two components: that resulting from differences in observed characteristics and that resulting from differences in the coefficients, that is, how the market values those characteristics.[27] For example, we estimate an earnings premium of 0.5 percent in 1992 for visible minorities over non-visible minorities among

[25] For the selection equation, dummy variables for marital status, presence of children and regions were employed as regressors. The other variables specified earlier in this section entered the second-stage equation as regressors.

[26] See, e.g., Dolton and Makepeace (1987).

[27] In order to be able to present the results in a compact and, insofar as possible, consistent format among the methods employed, we have transposed the estimates from the original regression results. Consequently, no test of significance are available.

1990 university graduates. This difference is decomposed into above-average levels of earnings-related characteristics that would normally result in a 1.9 percent premium above their peers (if abilities were evaluated with associated coefficient for the rest of the population). The estimated coefficients or "market value" of these characteristics based on observations of visible minorities alone, however, fall below those of their peers. This lower market price for earnings-related characteristics of minority groups accounts for 1.4 percent lower earnings among visible minorities. Thus the higher level of earnings-related characteristics for visible minorities partly offsets the lower prices they realize for these characteristics, producing a small earnings premium over non-visible minority university graduates.

The "Difference in Selection" headings in the table refer to the findings based on the Mills Ratio derived from the first stage of the Heckman procedure, involving a comparison of results from separate regressions for the equity group and the rest of the population. For our purposes, the indicator of possible discrimination is the difference "due to coefficients." This difference provides a summary of the way labour markets value the same ability as embodied in visible minorities compared to their peers.

For university students, the labour market appears to systematically value the earnings-related characteristics of equity groups below those of their peers. For visible minorities and the activity limited, the difference due to coefficients is negative for each of the three observation. For aboriginals, differences due to coefficients are negative except for the 1995 observation on 1990 graduates. Estimates of this market price disadvantage among equity groups generally fall in the range of 1 to 10 percent. In most cases, this disadvantage is partly offset by minority groups gaining above average levels of characteristics, such as education or experience.

For college students, similarly, the labour market sets lower values on the characteristics of most equity groups, as indicated by differences due to coefficients being negative. This is true in all cases except that of visible minorities in 1995 where the value is near zero. Among visible minorities, these lower market values range from close to no earnings discrepancy in the 1990 college graduate cohort in 1995 earnings, to a earnings deficit of more than 3.3 percent in the 1995 cohort in 1997. Among aboriginal and activity limited college graduates, lower market

prices for characteristics result in lower earnings for these equity groups ranging from -0.2 percent to 7.0 percent for aboriginals and -1.3 percent to 5.5 percent for the activity limited.

We take these earnings differentials to be non-trivial, particularly when they reach levels beyond 5 percent. At salary levels of $40,000 per year, 5 percent means a reduction in annual salary of $2,000. If such differentials persist over a 40 year working career with rising wages over time, the cumulative earnings deficit could easily surpass $100,000.

7.4 Reverse Regression Model

The reverse regression model provides upper and lower bounds on the extent of earnings discrimination that may be present in Canadian labour markets for university and college graduates. In Table 14, the top line is the estimated coefficient of the designated groups dummy variable derived from a conventional OLS regression on university graduates.

The second line is an alternate estimate. It provides an answer to the question: How would a given set of measured qualities be compensated differently if one were a member of an equity group compared to the rest of the population? Instead of the conventional regression of ability on earnings (where the coefficients are the estimated market prices of those abilities), we take the market value of these abilities (as evaluated at mean market values from the OLS regression) and regress them on observed earnings and an equity group dummy to capture systematic differences in the way abilities of equity groups are rewarded in the market.

The estimated difference in reward is calculated as the inverse ratio of the equity group coefficient and the log earnings coefficient from the regression on ability. This then gives an alternate estimate on the proportional change in the earnings for a fixed set of abilities. Combining these estimates gives an upper and lower bound, or the possible range of earnings differentials associated with equity group status.

The figures in Table 14 show that, in the great majority of cases, the range of earnings differentials between members of equity groups and the rest of the population falls primarily in the negative ranges. For example for 1990 University Graduates, the upper and lower bound of the earnings differential associated with visible minorities in 1992 was -1.6 percent to -5.8 percent.

Table 14 **Reverse Regression Coefficients on Dummy Variables for Employment-Equity Groups, 1992, 1995 (1990 Cohort) and 1997 (1995 Cohort)**

	Visible Minorities			Aboriginal People			Activity Limited		
	1992	*1995*	*1997*	*1992*	*1995*	*1997*	*1992*	*1995*	*1997*
University Graduates									
Estimate from Forward Regression	-0.016	-0.024	-0.029	-0.053	0.017	-0.013	-0.054	-0.021	-0.087*
Estimate from Reverse Regression	-0.058*	-0.070*	-0.097*	-0.131	0.105	0.064	-0.055	-0.011	-0.110
College Graduates									
Estimate from Forward Regression	-0.032*	-0.044*	-0.078*	-0.023	-0.100*	-0.068*	-0.055*	-0.064*	-0.092*
Estimate from Reverse Regression	-0.099*	-0.129*	-0.292*	-0.001	-0.103	-0.507*	-0.123*	-0.047	-0.420*

Note: Asterisk (*) indicates significance at .05 level for the coefficients.

Results for university graduates are generally not statistically significant, while those for college graduates are much more likely to be statistically significant. University graduates who were visible minorities had statistically significant earnings differentials derived from the reverse regressions that ranged from 5.8 percent to 9.7 percent between the two cohorts, two years after graduation. Remaining results from the reverse regressions were statistically insignificant for aboriginal and activity limited groups.

Among college graduates, estimates of earnings penalties among equity groups run as high as 29 to 50 percent, as measured in 1997 earnings. In each of these cases, the lower bound is also statistically significant, ranging from 6.8 percent for aboriginals to 9.2 percent for the activity limited.

Results for the reverse regression indicate that earnings discrimination is possible against members of equity groups in the college graduate population. The upper and lower bounds of this potential bias in earnings is however, very wide.

7.5 Fixed Model Effects

The fixed effects model nets out the impact of unobserved factors related to earnings, and by its nature answers a different question than the other models presented here. Whereas all other models examine data from a given year and tests whether the differences between groups could

be due to discrimination, the fixed effects model looks at changes in income over time and tests whether the changes over time could be associated with discrimination.

The estimation procedure is ordinary least squares including a dummy variable for equity group status. The dependent variable in our model is the natural logarithm of the earnings in 1995 minus the natural logarithm of earnings in 1992 (or the natural logarithm of the ratio of earnings in the two years). In effect, this specification answers the question whether there is discrimination in promotion opportunities or other events associated with rising wages over time.

Table 15 Coefficients on Dummy Variables for Visible Minorities in Fixed Effects Model, 1992-1995 (1990 Cohort)

	1992-1995	
	University Graduates	*College Graduates*
Coefficient of Dummy Variable or Visible Minorities	0.054	-0.040
(standard error in brackets)	(.0542)	(.0667)

Note: Asterisk (*) indicates significance at .05 level for the coefficients.

In general, our results for the fixed effects model were inconclusive. The coefficient of the dummy variable for visible minorities was not significantly different from zero. Among University graduates, the earnings for visible minorities grew 5 percent faster than the rest of the university graduate population, while among college graduates earnings grew 4 percent slower.

8. Conclusion

This study set out to examine the labour market outcomes of employment equity groups – visible minorities, Aboriginal people and the activity limited – compared to their peers in recent post-secondary graduating classes. Recent graduates comprise an excellent source for such comparisons of earnings and employment since much of their earnings potential is embodied in the level and field of study they have just completed; their recent entry means that comparisons gauge current labour market conditions rather than an amalgamation of past conditions across a mixture of cohorts; and, any inter-group differences due to previous job experience are minimized. The study employed a variety of statistical techniques. It was hoped that there might be some confluence among their results which would establish a clear case for or against the existence of systematic differences in labour market situations between any of the groups and the remainder of the population.

Clearly, members of the targeted groups did not fare as well as their classmates in the labour market of the 1990s. Although the unadjusted earnings of visible minorities were equal to or slightly higher than average at some time points, a number of different regression models consistently pointed to earnings penalties for visible minorities in the range of one to ten percent as summarized in Tables 16 and 17. In other words, visible minorities were more concentrated in higher degree levels and fields of study that generally lead to better paying jobs, yet their average earnings did not reflect their better qualifications. The earnings penalties for Aboriginal people and the activity limited estimated in the regression models were similar in scale (from one to ten percent) and their unadjusted earnings usually lagged the average as well.

An alternative estimation technique, reverse regression, tended to show larger earnings differentials for the employment equity groups. This technique estimates the minority penalty as it deviates from the market value of a fixed set of characteristics. Reverse regression estimates of the earnings differentials of up to 13 percent were noted in the cohort of 1990 graduates. In the 1997 data on the class of 1995, similar earnings discrepancies were noted for minority university graduates, while the disadvantage for community college graduates ballooned to 29 percent for visible minorities, 42 percent for the activity limited and 51 percent for Aboriginal

people. These results stretch credulity, however, and additional work is required to ensure that there are no significant problems in the data.

Table 16 **Summary Table for University Graduates - 1992 and 1995 (1990 Cohort) and 1997 (1995 Cohort)**

	Visible Minorities			Aboriginal People			Activity Limited		
	1992	*1995*	*1997*	*1992*	*1995*	*1997*	*1992*	*1995*	*1997*
Ordinary Least-Squares									
Coefficient of Designated Group	-0.016	-0.024	-0.029	-0.053	0.017	0.013	-0.054	-0.021	-0.087*
Jackson-Lindley Approach									
Difference between designated group and all others	0.005*	0.003*	0.009*	-0.015*	-0.036*	-0.049*	-0.054*	-0.027*	-0.076*
• Due to characteristics	0.022*	0.028*	0.030*	0.038*	-0.053*	-0.037*	-0.000*	-0.006*	0.012*
• Due to coefficients	-0.017*	-0.025*	-0.028*	-0.053*	0.017*	-0.012*	-0.059*	-0.021*	-0.089*
Coefficient of Designated Group	0.483	0.396	1.074*	-2.056*	-0.090	0.182	-0.158	0.023	0.002
Heckman Approach									
Difference between designated group and all others	0.005	0.004	0.002	-0.015	-0.038	-0.044	-0.054	-0.027	-0.076
• Due to characteristics	0.019	0.020	0.017	0.052	-0.043	-0.033	0.016	0.003	0.023
• Due to coefficients	-0.014	-0.016	-0.015	-0.067	0.005	-0.011	-0.070	-0.030	-0.099
Reverse Regression Approach									
Coefficient of Designated Group from OLS	-0.0157	-0.0240	-0.029	-0.053	0.017	-0.013	-0.054	-0.021	-0.087*
Coefficient of Designated Group from Reverse Regression	-0.0580*	-0.0698*	-0.097*	-0.131	0.105	0.064	-0.055	-0.011	-0.110

Note: Asterisk (*) indicates statistical significance at .05 level for the coefficients.

The labour market disadvantages of the target groups were not limited to earnings. For each group and at every time point, employment rates fell below the relevant class average. Among university graduates, employment rates were from one-half a percentage point to three-and-a-half percentage points lower than the 1990 class average. Among community college graduates the differences were greater, ranging from two-and-a-half to nine-and-a-half percentage points. Employment differentials were even greater among 1995 graduates, ranging up to 14 percentage points for Aboriginal people university graduates in 1997. Again, the results for 1995 graduates appear to have significant problems and we are reluctant to endorse our results until the underlying data can be verified.

Table 17 **Summary Table for College Graduates - 1992 and 1995 (1990 Cohort) and 1997 (1995 Cohort)**

	Visible Minorities			Aboriginal People			Activity Limited		
	1992	*1995*	*1997*	*1992*	*1995*	*1997*	*1992*	*1995*	*1997*
Ordinary Least-Squares									
Coefficient of Designated Group	-0.0322*	-0.0437*	-0.0781*	-0.0229	-0.1004*	-0.0675*	-0.0546*	-0.0642*	-0.0918*
Jackson-Lindley Approach									
Difference between designated group and all others	-0.0092*	-0.0036*	-0.0330*	-0.0303*	-0.0991*	0.0246*	-0.0310*	-0.0724*	-0.0224*
• Due to characteristics	0.0236*	0.0406*	0.0462*	-0.0074*	0.0016*	0.0930*	0.0242*	-0.0084*	0.0691*
• Due to coefficients	-0.0328*	-0.0442*	-0.0792*	-0.0229*	-0.1007*	-0.0683*	-0.0552*	-0.0641*	-0.0916*
Coefficient of Designated Group	-0.3685	-0.1107	0.4464	-0.4278	0.5633	0.6126	0.4164	-0.3350	0.9992*
Heckman Approach									
Difference between designated group and all others	-0.0074	-0.0034	-0.0333	-0.0303	-0.0957	0.0244	-0.0312	-0.0725	-0.0229
• Due to characteristics	0.0106	0.0010	0.0091	0.0148	-0.0022	0.0696	0.0339	-0.0131	0.0551
• Due to coefficients	-0.0180	-0.0044	-0.0424	-0.0451	-0.0935	-0.0453	-0.0651	-0.0593	-0.0780
Reverse Regression Approach									
Coefficient of Designated Group from OLS	-0.0322*	-0.0437*	-0.0781*	-0.0229	-0.1004*	-0.0675*	-0.0546*	-0.0642*	-0.0918*
Coefficient of Designated Group from Reverse Regression	-0.0985*	-0.1288*	-0.2924*	-0.0014	-0.1032	-0.5067*	-0.1226*	-0.0468	-0.4195*

Note: Asterisk (*) indicates statistical significance at .05 level for the coefficients.

If the lower employment rates of minority groups reflect substantial employment barriers, even the adjusted earnings differentials may be underestimated. To correct for this potential bias, the sample selectivity correction procedure suggested by Heckman (1979) was employed. In general, the selectivity-corrected earnings differentials were very similar to the uncorrected differentials estimated with the other regression techniques, even though there were some substantial differences in the sources and magnitudes of selectivity between the minority and non-minority groups. These results further confirm the notion that equally qualified minority group members are less likely than their classmates to find work and provide further corroborating evidence of earnings discrepancies for those who have found jobs.

These results indicate that there is a pool of highly trained, under-utilized graduates in Canada identifiable by their skin colour, Aboriginal heritage or activity limitations. And while we cannot observe it directly, the results are highly suggestive of discriminatory practices on the part of at least some employers. Even though a large majority of employers may not engage in any

discriminatory practices, they will benefit from the practices of discriminators since they are able to pick from a larger pool of graduates for a given job at a given wage rate. And while classical economic theory suggests that advantages accruing to non-discriminatory employers should wipe out discrimination through the mechanism of market discipline in the long run, the "imperfect" (i.e. Social and institutional) aspects of labour markets seem to have prevented this from occurring in markets where discrimination has long been a problem.

Some of the social aspects of labour markets may also put minority group members at a disadvantage, but would not usually be thought of as discrimination. For example, informal networks – the help and advice of family and friends – are an important source of potential employment contacts. Graduates from groups whose family are less likely to have post-secondary education or whose families are less likely to live in Canada may have fewer opportunities stemming from informal networks. While their relative misfortune may not be the result of direct discrimination, it is no less real to them and may be even more amenable than direct discrimination to policy action. The extent to which job search patterns and the lack of informal networks are problems for the target groups therefore bears further research.[28]

This work is far from the final word on the issue of the discrimination against minority groups in the Canadian labour market. Additional research would include a more extensive exploration of the possibility of hiring bias against members of minority groups. While the Heckman procedure takes account of the possibility that discrimination keeps members out of the labour market and adjusts estimation procedures to eliminate any resulting bias, this paper does not fully test the hypothesis that equity groups face larger barriers to successful labour market participation compared to the overall population.

One other possibility that we are not able to test based on the public use files of the NGS is whether there is systematic bias against members of various components within the visibility minority designation. For example, the labour market could treat Blacks differently from Asians, with the differences largely netted out by consolidating both groups into a single designation.

[28] Although the National Graduates Surveys do not have information on search patterns or informal networks, the upcoming Workplace and Employee Survey will provide some information in this area.

We introduced this paper with the notion that any policies aimed at redressing earnings disparities for visible minorities, Aboriginal people or the activity limited must balance the potential benefits of such policies against the costs. In this paper, we have demonstrated that there are potential benefits on the individual level, in terms of eliminating residual earnings differentials, and on a societal level, by making better use of human capital we have all paid to develop. How best to achieve these benefits and what costs society is willing to bear are issues for others to determine.

Appendix A

Fixed Effect Models

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For each of the graduate cohorts, the NGS data files distinguish three reference years: the year of graduation; the year of the first post-graduation interview two years after graduation (year 2); and the year of the second post-graduation interview five years after graduation (year 5). These three reference years serve to partition the entire five-year post graduation period for each cohort into two sub-periods: the first post-graduation period from year of graduation to year of the first interview two years after graduation; and the second post-graduation period from year of first interview to year of second interview five years after graduation. For purposes of formulating our benchmark earnings model, it is notationally convenient to denote the year of graduation for a given graduate cohort as year t-2, the year of the first post-graduation interview as year t, and the year of the second post-graduation interview as year t+3. Let the annual earnings rate (in constant dollars) of graduate i in year t be denoted as $E_{i,t}$; similarly, let the annual earnings rate of respondent i in year t+3 be denoted as $E_{i,t+3}$. The dependent variables for the earnings equations are the natural logarithms of individual graduate's annual earnings rates. Accordingly, $y_{i,t} = \ln(E_{i,t})$ denotes the natural logarithm of the annual earnings rate for respondent i in year t (i.e., for the job held at the first interview), and $y_{i,t+3} = \ln(E_{i,t+3})$ the natural logarithm of the annual earnings rate for respondent i in year t+3 (i.e., for the job held at the second interview).

For each employment equity group, the log-earnings equations for years t and t+3 can be written in general as:

$$y_{i,t} = X_{i,t}\beta_t + X_i\gamma_t + \alpha_i + \alpha_t + \varepsilon_{i,t} \quad (1)$$

$$y_{i,t+3} = X_{i,t+3}\beta_{t+3} + X_i\gamma_{t+3} + \alpha_i + \alpha_{t+3} + \varepsilon_{i,t+3} \quad (2)$$

$X_{i,t}$ is a vector of current (time-varying) characteristics containing observed year- and person-specific earnings determinants for graduate i in year t and b_t a corresponding coefficient vector; similarly $X_{i,t+3}$ is a vector of observed year- and person-specific earnings determinants for graduate i in year t+3 and b_{t+3} a corresponding coefficient vector. X_i is a vector of observed

person-specific but time-invariant earnings determinants for person i in years t and t+3, and g_t and g_{t+3} denote the coefficient vectors for X_i for years t and t+3, respectively. Earnings equations (1) and (2) incorporate both individual fixed effects and year fixed effects to control for unobserved earnings determinants across individuals and over time. The individual fixed effects are represented by the individual-specific constants a_i, and the year fixed effects by the year-specific constants a_t and a_{t+3} (which correspond to the years of the first and second post-graduation interviews, respectively). Finally, $e_{i,t}$ and $e_{i,t+3}$ denote unobserved person- and year-specific random errors for graduate i in years t and t+3, respectively. Note that equations (1) and (2) allow the coefficients of the observed earnings covariates X_i and $X_{i,t}$ to differ between the two years for which post-graduation data are available. Changes over time in the marginal earnings effects of the observed earnings determinants is one way in which earnings of the employment equity groups and the remainder of the population may diverge or converge following graduation.

It is not possible to separately estimate the earnings *level* equations (1) and (2) in a fixed effects specification. As is well known, it is impossible to separately identify the coefficients of the time-invariant baseline characteristics (i.e., the coefficient vectors g_t and g_{t+3} of the person-specific time-invariant covariates X_i) and the individual fixed effects (i.e., the individual-specific constants a_i). The reason for this is that the individual-specific fixed effects completely capture the effects on earnings levels of all time-invariant, person-specific covariates, thereby making it impossible to identify and estimate the partial earnings effects of the time-invariant baseline characteristics in X_i. The conventional approach to estimation in such cases is to estimate the earnings equation in differenced form by conventional OLS, since differencing over time eliminates the individual-specific constants a_i from the estimating equation. We therefore difference the earnings equations (1) and (2) by subtracting earnings equation (1) from earnings equation (2); this yields the log-earnings-growth equation:

$$\Delta y_{i,t+3} = X_{i,t+3}\beta_{t+3} - X_{i,t}\beta_t + X_i(\gamma_{t+3} - \gamma_t) + (\alpha_{t+3} - \alpha_t) + (\varepsilon_{i,t+3} - \varepsilon_{i,t}) \qquad (3)$$

where $\Delta y_{i,t+3} = y_{i,t+3} - y_{i,t}$ is the log-earnings growth rate for graduate i between year t (the initial interview) and year t+3 (the follow-up interview). Equation (3) relates the three-year

earnings growth rate for graduate i between the second and fifth post-graduation years to three sets of observable variables: (1) the vector $X_{i,t}$ of time-varying covariates for graduate i in year t; (2) the vector $X_{i,t+3}$ of time-varying covariates for graduate i in year t+3; and (3) the vector X_i of time-invariant covariates for graduate i. Note that the coefficients associated with the X_i variables represent *differences* in the marginal effects of these variables between the second and fifth post-graduation years; if these marginal effects are constant over time, then graduates' earnings growth after graduation is unrelated to their time-invariant baseline characteristics.

Although the earnings growth equation (3) can be estimated as it stands, it may be instructive to reformulate it by simultaneously adding to and subtracting from the right-hand side the term $X_{i,t}\beta_{t+3}$. After some straightforward rearrangement, equation (3) can then be rewritten as:

$$\begin{aligned}\Delta y_{i,t+3} &= (X_{i,t+3} - X_{i,t})\,\beta_{t+3} + X_{i,t}(\beta_{t+3} - \beta_t) + X_i(\gamma_{t+3} - \gamma_t) + (\alpha_{t+3} - \alpha_t) + (\varepsilon_{i,t+3} - \varepsilon_{i,t}) \\ &= \Delta X_{i,t+3}\beta_{t+3} + X_{i,t}\Delta\beta_{t+3} + X_i\Delta\gamma_{t+3} + \Delta\alpha_{t+3} + u_{i,t+3} \qquad (4)\end{aligned}$$

where $\Delta X_{i,t+3} = X_{i,t+3} - X_{i,t}$ is a vector representing changes in time-varying covariates for graduate i between years t and t+3; $\Delta\beta_{t+3} = \beta_{t+3} - \beta_t$ is a vector of coefficient differences between the initial and follow-up years for the individual- and time-varying covariates; $\Delta\gamma_{t+3} = \gamma_{t+3} - \gamma_t$ is a vector of coefficient differences between years t and t+3 for the time-invariant and person-specific covariates; $\Delta\alpha_{t+3} = \alpha_{t+3} - \alpha_t$ is the difference in unobserved year-specific fixed effects for years t and t+3 (which is a constant for each graduate cohort but varies across graduate cohorts); and $u_{i,t+3} = \varepsilon_{i,t+3} - \varepsilon_{i,t}$ is the unobservable individual- and time-varying random error. Equation (4) relates the three-year earnings growth rate for graduate i to three sets of observed worker and job characteristics: (1) the vector X_i of individual-specific and time-invariant baseline characteristics; (2) the vector $X_{i,t}$ of individual- and time-varying characteristics for year t (the year of the initial interview); and (3) the vector $\Delta X_{i,t+3}$ of differences in individual and time-varying characteristics between the second and fifth post-graduation years. The log-earnings-growth equations (3) and (4) are of course formally equivalent; they are simply alternative ways of estimating and presenting the coefficient estimates of the earnings growth equation.

First, by estimating equation (4) on the pooled sample of all groups, i.e., the entire population, we can test for differences in the marginal effects of baseline characteristics, current characteristics, and changes in current characteristics on the early post-graduation earnings growth of employment equity group and other university graduates in Canada. Assuming there are such differences in the specified models, separate coefficient estimates of the log-earnings-growth equation (3) or (4) for employment equity group and other graduates may be estimated. The empirical relevance of recent graduates' measured baseline characteristics (the X_i regressors) in accounting for post-graduation earnings growth can be investigated by testing whether some or all of the coefficients in the vector $\Delta\gamma_{t+3} = \gamma_{t+3} - \gamma_t$ are equal to zero for employment equity group members and other graduates and assessing the magnitudes of the relevant coefficient estimates. Similarly, whether the effects of graduates' observed current characteristics two years after graduation (the $X_{i,t}$ regressors) have discernible effects on post-graduation earnings growth can be assessed by inspecting the coefficients in the vector $\Delta\beta_{t+3} = \beta_{t+3} - \beta_t$ in equation (4). Finally, the extent to which changes in graduates' current worker and job characteristics (the $\Delta X_{i,t+3}$ regressors) influence earnings growth may be revealed by the b_{t+3} coefficient estimates.

Appendix B

Industry and Occupation Coding

The following tables indicate how occupations and industries were combined into groups for the purposes of constructing occupation and industry group dummies.

Table B1 **Occupation Groups**

Occupation Description	*Standard Occupation Classification(1980) Codes*
Managers	1111-1158
Managerial Related	1171-1179
Physical & Life Sciences	2111-2139
Architecture & Engineering	2141-2169
Math & Computer Science	2181-2189
Social Sciences & Religion	2311-2519
University Teaching	2711-2719
Other Teaching	2731-2799
Health Diagnosis	3111-3119
Nursing, Other Health	3130-3169
Arts & Recreation	3311-3379
Clerical	4110-4199
Sales	5130-5199
Service Occupations	6111-6199
Blue Collar	7113-9599
Not Specified	Less than 1111 or 9910 - 9919

Table B2 **Industry Groups**

Industry Description	*Standard Industrial Classification(1980) Codes*
Primary Industries	001-092
Manufacturing & Construction	101-449
Transport, Communications & Utilities	451-499
Wholesale Trade	501-599
Retail & Consumer Services	601-692 & 911-999
Finance	701-729 & 741-749
Insurance & Real Estate	731-733 & 751-761
Education	851-859
Health	861-866
Welfare & Religion	867- 869 & 981
Services to Business Management	771-779
Public Administration	811-841
Not Specified	Greater than 999

Appendix C

Sample Counts and Attrition

One of the difficulties in dealing with longitudinal data such as the NGS is the problem of attrition: the loss of original respondents through subsequent waves of the survey. Subsequent data from initial respondents may not be obtainable for a variety of reasons including respondents moving out of the country, refusing to respond, death, or respondent cannot be found within the time constraints of the follow-up survey. The concern is that those who are not observed differ systematically from the observed. These differences can lead to biased conclusions if analysis variables are correlated with reasons for disappearance from the sample. Attrition is not a problem if the unobserved are otherwise very much like the observed.

Some steps are taken to minimize the impact of attrition on follow-up survey analyses. Weights are adjusted to account for attrition along several known population characteristics (e.g. Type of institution, province, gender and degree level). Whether this calibration has a positive effect on other variables needs to be examined. The relatively high attrition rates for target group respondents detailed in the following section could mean biases creep into the results. However, the deeper analysis that follows indicates that attrition has negligible effects on earnings comparisons.

Attrition among University Students

Table C1 shows that 27.9 percent of the visible minorities university graduates surveyed in 1992 are no longer in the sample in 1995, a much higher attrition rate than the 16.9 percent average for the 1992 sample. Attrition rates for Aboriginals of 19.1 percent, and the activity limited of 17.7 percent, are more in line with rates in the overall population.

A possible obvious explanation for the higher attrition rates among visible minorities is that 80 percent of visa students – those from other countries studying in Canada – are visible minorities.[29]

[29] Visa status is reported by the institution rather than the respondent. Quebec institutions provided no information on the visa status of their graduates. Note also that visa status can change over time, so that some graduates who started off as visa students may later receive landed immigrant status.

Table C1 **Attrition Counts and Rates for University Graduates, 1992 to 1995 (1990 Cohort)**

	No Attrition (observations in 1992 and 1995)	Attrition (observations in 1992 but not in 1995)	Total
Counts			
Visible minorities	8,548	3,304	1, 852
Aboriginal people	1,270	299	1,568
Activity limited	3,988	860	4,848
Total Population	104,736	21,258	125,993
Horizontal Percentage			
Visible minorities	72.1%	27.9%	100.0%
Aboriginal people	81.0%	19.1%	100.0%
Activity limited	82.3%	17.7%	100.0%
Total Population	83.1%	16.9%	100.0%
Vertical Percentage			
Visible minorities	8.2%	15.5%	9.4%
Aboriginal people	1.2%	1.4%	1.2%
Activity limited	3.8%	4.0%	3.8%
Total Population	100.0%	100.0%	100.0%

As a group, visa students are far more likely to be missing from the follow-up data than non-visa students. Table C2 shows a breakdown of visa students among University graduates. Over half of these visa students, 54 percent, are surveyed in 1992 but no data are available from the 1995 follow-up.

Table C2 **Visa Students Among University Graduates, 1992 (1990 Cohort)**

	No Attrition (observations in 1992 and 1995)	Attrition (observations in 1992 but not in 1995)	Total
Counts			
Visa Student	420	493	913
Not Visa Student	79,621	15,485	95,106
Not stated	24,696	5,279	29,974
Total	104,736	21,258	125,993
Horizontal Percentage			
Visa Student	46.0%	54.0%	100.0%
Not Visa Student	83.7%	16.3%	100.0%
Not stated	82.4%	17.6%	100.0%
Total	83.1%	16.9%	100.0%
Vertical Percentage			
Visa Student	0.4%	2.3%	0.7%
Not Visa Student	76.0%	72.8%	75.5%
Not stated	23.6%	24.8%	23.8%
Total	100.0%	100.0%	100.0%

Attrition among College and Trade and Vocational Students

The overall attrition rate of 15.7 percent among college graduates is similar to that of University graduates at 16.9 percent. As seen among university graduates, college educated visible minorities have substantially higher attrition rates, 25.4 percent, than the overall college population. Unlike the university population, however, attrition rates of 24.2 percent for the Aboriginal people and 21.0 percent for the activity limited are much higher than the overall population, and closer to that of visible minorities.

Table C3 **Basic Counts and Percentages of Visible Minorities, Aboriginal people and Activity Limited for College Graduates, 1992 (1990 Cohort)**

	No Attrition (observations in 1992 and 1995)	Attrition (observations in 1992 but not in 1995)	Total
Counts			
Visible minorities	6,503	2,217	8,720
Aboriginal people	2,160	691	2,851
Activity limited	5,197	1,383	6,580
Total Population	84,851	15,743	100,594
Horizontal Percentage			
Visible minorities	74.6%	25.4%	100.0%
Aboriginal people	75.8%	24.2%	100.0%
Activity limited	79.0%	21.0%	100.0%
Total Population	84.3%	15.7%	100.0%
Vertical Percentage			
Visible minorities	7.7%	14.1%	8.7%
Aboriginal people	2.5%	4.4%	2.8%
Activity limited	6.1%	8.8%	6.5%
Total Population	100.0%	100.0%	100.0%

Attrition rates among visa students at the college level, however, are much lower than at the university level. Only 23.7 percent of visa students at the college level were observed in 1992 but not in 1995, compared to the 54 percent attrition rate of visa students at the university level.

Among both the university and college graduates, visa students make up a relatively small proportion of the attrited population at 2.3 percent, but they are concentrated within the visible minority group.

Table C4 **Visa Students Among College Graduates, 1992 (1990 Cohort)**

	No Attrition (observations in 1992 and 1995)	Attrition (observations in 1992 but not in 1995)	Total
Counts			
Visa Student	1,167	362	1,530
Not Visa Student	70,150	13,377	83,527
Not stated	13,533	2,004	15,537
Total	84,851	15,743	100,594
Horizontal Percentage			
Visa Student	76.3%	23.7%	100.0%
Not Visa Student	84.0%	16.0%	100.0%
Not stated	87.1%	12.9%	100.0%
Total	84.3%	15.7%	100.0%
Vertical Percentage			
Visa Student	1.4%	2.3%	1.5%
Not Visa Student	82.7%	85.0%	83.0%
Not stated	15.9%	12.7%	15.4%
Total	100.0%	100.0%	100.0%

Including former visa students in the population may introduce a bias into the results on discrimination because they may face additional labour market barriers unrelated, in an economic sense, to their visible minority status. On the other hand, former visa students who have remained in Canada long enough to be included in these surveys show similar commitment to the Canadian labour market as their classmates and are likely to have legal working status in Canada. Furthermore, excluding former visa students from the earnings comparisons would be a very imprecise exercise due to the missing information from Quebec and concerns about the quality and consistency of the information from other regions.

Does Attrition Cause Bias in Earnings Comparisons?

One of the great advantages of longitudinal data is that they afford the opportunity to look at such issues as attrition bias without resorting to out-of-sample experiments or theoretical censoring models. In this case, there are a number of graduates for whom earnings data were collected in 1992 but could not be interviewed in 1995. Thus, the 1992 earnings patterns of those who subsequently dropped out of the sample can be compared to those remained in. The best way to do this is in the context of an earnings model that controls for many factors related to earnings.

We have presented a number of such models in the body of this paper and so will highlight only the results that relate to attrition in this section.

The two models of interest are detailed in Tables C5 and C6. These are 1992 earnings models for university and college graduates, respectively, that include indicators of future attrition and allow direct comparisons between members of visible minorities and others.[30] In the case of university graduates, attrition effects are negligible both in terms of the overall effects and minority /non-minority differences. For college graduates there was a significant attrition effect—those who dropped out of the sample earned about 10 percent less than continuers in 1992. However, this effect did not differ significantly between visible minorities and others in this graduating class. Thus, while there is some evidence of attrition bias for college graduates it should not taint earnings comparisons between the two groups.

Table C7 presents the coefficients on the attrition dummy variable for the all of the equity group earnings equations for 1992. In some cases the magnitude of the coefficient on the interaction term for attrition is large, but in no case is the coefficient statistically significantly different from zero. The largest differences, implying a sizeable difference between the earnings of the attrited minority group and the remainder of the attrited population is among aboriginal university graduates, and the activity limited. Controlling for other factors, those aboriginal university students who go missing in the 1995 follow-up have twenty percent lower earnings than the rest of the attrited population. Similarly, activity-limited university graduates missing from the 1995 follow-up had 1992 earnings 17 percent below the rest of the attrited population. Those activity limited missing from the college population in 1995 had earnings 13 percent above the rest of the attrited population in 1992.

While these differences in average earnings among the attrited equity group populations raise some concerns, none of the estimated differences are statistically significantly different from zero. So while attrition may create problems in terms of sample size (reducing the precision of 1995 estimates) and the consistency of college estimates (due to the overall bias), it should have little bearing on earnings comparisons across these groups of graduates.

[30] Although the attrition variable was included in 1992 earnings models for the other target groups, the sample size was too small to yield precise estimates.

Table C5 Jackson-Lindley Approach to Visible Minorities, University Graduates in 1992

	Regression with interaction terms				Regression without interaction terms		Mean Values for visible minorities	
	Standard Terms		*Interaction Terms*					
	Coeff.	P>|z|	Coeff.	P>|z|	Coeff.	P>|z|	No	Yes
Log (Earnings in 1992)							10.3117	10.3139
Age in 1992	0.0516	0.000	-0.0288	0.038	0.0480	0.000	29.6302	28.8926
Age Squared in 1992	-0.0005	0.000	0.0003	0.060	-0.0005	0.000	924.5941	870.4331
French Mother Tongue	0.0238	0.077	0.0424	0.474	0.0280	0.033	0.2575	0.0482
Other Mother Tongue	-0.0013	0.802	0.0088	0.280	0.0016	0.649	1.2968	2.0545
Changed province for school, still working in that province	-0.0327	0.189	-0.1367	0.040	-0.0539	0.020	0.0445	0.0847
Changed province for school change province again for work	0.0126	0.501	-0.0673	0.259	0.0081	0.649	0.0929	0.0818
One Parent has Post-Sec. degree	-0.0150	0.211	0.1126	0.004	-0.0053	0.643	0.5289	0.5200
Married in 1992	0.0458	0.000	-0.0400	0.050	0.0413	0.000	0.4398	0.3233
Unmarried in 1992	-0.0138	0.664	-0.0446	0.602	-0.0164	0.589	0.0403	0.0261
Has a Child in 1992	0.0181	0.270	0.0552	0.221	0.0205	0.189	0.1990	0.1452
Education faculty	0.0712	0.022	0.1962	0.106	0.0822	0.006	0.2059	0.0860
Fine arts	-0.1369	0.000	0.1083	0.401	-0.1269	0.000	0.1313	0.0978
Commerce, economics and law	0.1811	0.000	0.0436	0.699	0.1855	0.000	0.2043	0.2043
Other social sciences	0.0056	0.865	0.0229	0.850	0.0079	0.801	0.1783	0.1476
Agriculture, biological sciences	-0.0707	0.048	0.0076	0.952	-0.0682	0.046	0.0526	0.0752
Engineering	0.3460	0.000	0.0085	0.940	0.3421	0.000	0.0667	0.1460
Medicine & other health pr.	0.2469	0.000	-0.0158	0.901	0.2479	0.000	0.0709	0.0897
Math & physical sciences	0.2110	0.000	0.0846	0.475	0.2186	0.000	0.0536	0.1174
Masters	0.1390	0.000	0.0031	0.940	0.1380	0.000	0.1531	0.1722
PhD	0.1647	0.000	-0.0441	0.414	0.1455	0.000	0.0177	0.0411
Pre-Grad. Experience > 3 years	0.0916	0.000	0.1413	0.005	0.1013	0.000	0.2650	0.1440
Atlantic Resident	-0.2205	0.000	-0.3087	0.007	-0.2307	0.000	0.0874	0.0239
Quebec Resident	-0.0798	0.000	-0.1398	0.003	-0.0922	0.000	0.2384	0.1518
Manitoba & Sask. Resident	-0.2269	0.000	0.0499	0.523	-0.2272	0.000	0.0760	0.0438
Alberta Resident	-0.1237	0.000	-0.0453	0.514	-0.1314	0.000	0.0851	0.0864
B.C. & Territories Resident	-0.0300	0.104	-0.0755	0.131	-0.0368	0.031	0.0949	0.1648
Public Sector in 1992	0.0532	0.002	-0.0863	0.071	0.0459	0.004	0.5582	0.4204
Hours Worked in 1992	0.0161	0.000	0.0042	0.083	0.0164	0.000	41.3746	40.7842
Female	0.0019	0.894	0.0185	0.618	0.0053	0.691	0.5509	0.4918
Attrition	-0.0293	0.546	-0.0245	0.699	-0.0540	0.083	0.1345	0.2340
Visible Minority / Constant			0.3371	0.291	-0.0137	0.474	0	1
Constant	8.4959	0.000			8.5460	0.000		
Number of Observations	87640.42				87640.42			
F	54.87				103.41			
Prob > F	0				0			
R-squared	0.3212				0.3163			
Characteristics Component	-0.0185							
Coefficients Component	-0.0163							

Table C6 Jackson-Lindley Approach to Visible Minorities, College Graduates in 1992

	Regression with interaction terms				Regression without interaction terms		Mean Values for visible minorities	
	Standard Terms		*Interaction Terms*					
	Coeff.	P>|z|	Coeff.	P>|z|	Coeff.	P>|z|	No	Yes
Log (Earnings in 1992)							10.0409	10.0216
Age in 1992	0.0392	0.000	-0.0210	0.253	0.0377	0.000	28.2460	29.8268
Age Squared in 1992	-0.0005	0.000	0.0003	0.212	-0.0005	0.000	852.2245	944.9526
French Mother Tongue	-0.0118	0.447	-0.0725	0.623	-0.0124	0.420	0.2468	0.0265
Other Mother Tongue	0.0004	0.942	0.0035	0.651	0.0002	0.962	1.1947	2.1184
Changed province for school still working in that province	0.0744	0.011	0.0504	0.522	0.0774	0.004	0.0200	0.0315
Changed province for school changed province again for work	0.0168	0.531	0.0529	0.562	0.0197	0.447	0.0401	0.0411
One Parent has Post-Sec. degree	0.0333	0.003	0.0076	0.833	0.0352	0.001	0.3445	0.3556
Married in 1992	0.0475	0.000	-0.0460	0.295	0.0448	0.000	0.4127	0.3876
Unmarried in 1992	-0.0118	0.659	0.0705	0.390	-0.0067	0.794	0.0551	0.0325
Has a Child in 1992	-0.0364	0.012	-0.0294	0.623	-0.0369	0.009	0.2439	0.3012
Health Sciences	0.3196	0.000	0.1659	0.008	0.3299	0.000	0.1372	0.1242
Other Engineering Tech.	0.1985	0.000	0.1076	0.067	0.2070	0.000	0.0405	0.0454
Electrical / Electronic Eng.	0.2224	0.000	0.0251	0.694	0.2257	0.000	0.0695	0.1146
Mech. & Structural Engineering	0.1480	0.000	-0.0794	0.325	0.1384	0.000	0.0429	0.0462
Natural Sciences & Prim. Industries	-0.0061	0.809	0.2704	0.076	-0.0011	0.965	0.0288	0.0073
Social Sciences & Services	0.0562	0.013	0.0170	0.800	0.0586	0.007	0.1089	0.0645
Secretarial Science & Merchandising	0.1079	0.000	0.0786	0.226	0.1137	0.000	0.0450	0.0513
Management & Administration	0.0932	0.000	0.1159	0.043	0.1025	0.000	0.1066	0.1222
Pre-Grad. Experience > 3 years	0.0759	0.000	0.0976	0.085	0.0844	0.000	0.3132	0.2393
Atlantic Resident	-0.2683	0.000	0.0228	0.759	-0.2710	0.000	0.0911	0.0133
Quebec Resident	-0.0793	0.000	-0.0894	0.238	-0.0830	0.000	0.2173	0.0972
Manitoba & Sask. Resident	-0.1780	0.000	-0.0296	0.624	-0.1811	0.000	0.0650	0.0316
Alberta Resident	-0.1161	0.000	-0.1396	0.017	-0.1272	0.000	0.1169	0.1097
B.C. & Territories Resident	-0.0312	0.078	-0.1006	0.023	-0.0390	0.018	0.1642	0.2954
Public Sector in 1992	0.1901	0.000	-0.0359	0.440	0.1891	0.000	0.4042	0.3485
Hours Worked in 1992	0.0198	0.000	0.0090	0.101	0.0205	0.000	38.0514	37.6554
Female	-0.1518	0.000	0.0715	0.084	-0.1451	0.000	0.5597	0.5309
Attrition	-0.1113	0.015	-0.0272	0.672	-0.1099	0.000	0.1268	0.2155
Visible Minority / Constant			-0.0668	0.832	-0.0417	0.027	0	1
Constant	8.5905	0.000			8.5836	0.000		
Number of Observations	67685.05				67685.05			
F	39.99				72.76			
Prob > F	0				0			
R-squared	0.2764				0.2722			
Characteristics Component	-0.0240							
Coefficients Component	-0.0434							

Table C7 Coefficients on Attrition Dummy Variable in 1992 Log Earnings Regressions

	From Regressions with interaction terms				From Regressions without interaction terms		Mean Values for visible minorities	
	Standard Terms		*Interaction Terms*					
	Coeff.	P>|z|	Coeff.	P>|z|	Coeff.	P>|z|	No	Yes
Visible Minority, University	-0.0293	0.546	-0.0245	0.699	-0.0540	0.083	0.1345	0.2340
Visible Minority, College	-0.1113	0.015	-0.0272	0.672	-0.1099	0.000	0.1268	0.2155
Aboriginal, University	-0.0507	0.106	-0.2040	0.174	-0.0544	0.080	0.1424	0.1692
Aboriginal, College	-0.1076	0.001	-0.0240	0.875	-0.1087	0.000	0.1330	0.1594
Activity Limited, University	-0.0468	0.115	-0.1670	0.389	-0.0548	0.078	0.1432	0.1304
Activity Limited, College	-0.1067	0.001	0.1299	0.293	-0.1069	0.001	0.1310	0.1794

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